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Universities Quarterly

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PRINCIPAL CONTENTS

HIGHER EDUCATION IN TECHNOLOGY

Articles by C. R. Morris, Sir Frederick Handley Page, R. S. Hutton, Cyril Lloyd, J. F. Baker.

SELECTION FOR UNIVERSITIES

by T. P. York, Lilian E. Charlesworth

REVIEWS BY D. G. Christopherson, Lord Lindsay of Birker, Kenneth Allott, Mary Morris, and others.

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VOL. 6. No. 2. FEBRUARY, 1952

Contents

Page

NOTES

Higher technological education. A degree of general agreement. A question of man-power. Academic freedom in Australia. The issue of party membership. Adult education in Scotland 115

ARTICLES

HIGHER EDUCATION IN TECHNOLOGY

I. THE UNIVERSITIES AND TECHNOLOGY *by* C. R. MORRIS .. 119

II. THE HIGHER TECHNOLOGY *by* SIR FREDERICK HANDLEY PAGE 125

III. THE UNIVERSITIES AND HIGHER POSTS IN INDUSTRY *by* R. S. HUTTON 132

IV. TECHNICAL EDUCATION FOR THE SUPERVISOR, CRAFTSMAN AND OPERATIVE *by* CYRIL LLOYD 139

V. THE UNIVERSITIES AND POST-GRADUATE COURSES IN TECHNOLOGY *by* J. F. BAKER 147

THE UNIVERSITIES AND SELECTION

I. *By* T. J. P. YORK 153

II. *By* LILIAN E. CHARLESWORTH 158

SCHOOLS OF EDUCATION IN AMERICAN UNIVERSITIES *by* C. H. DOBINSON 161

THE HISTORY AND PHILOSOPHY OF SCIENCE *by* DOUGLAS MCKIE .. 169

THE PLACE OF THE CLASSICS IN THE MODERN UNIVERSITY *by* PHILIP LEON 175

REVIEWS

Universities and Industry, and Education for Management reviewed by D. G. Christopherson. The Changing Culture of a Factory reviewed by Lord Lindsay of Birker. The Estate of Man reviewed by C. R. Morris. English Studies To-day reviewed by Kenneth Allott. Social Work in Britain reviewed by Mary Morris. National Conference of Canadian Universities reviewed by C. M. MacInnes. The University Teaching of International Relations reviewed by J. F. C. Harrison 183

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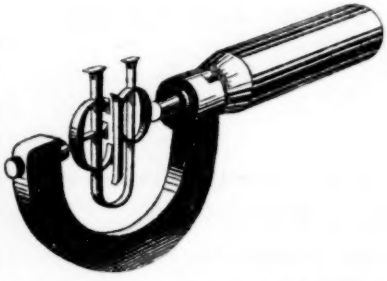

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NOTES

Higher technological education

This subject is naturally in the forefront of discussion. It is not known whether Mr. Churchill's Government will stand by the declared policy of its predecessor, whether it will launch out on some bold policy of its own, or whether general economic stringency will call a halt in this as well as in other fields of education. As this is the last year of a quinquennial period and Treasury grants for the next five years are unknown, even the universities do not know how much they will be able to do. They have more than doubled the pre-war number of their technological students, but costs are increasing and it is by no means clear how far they will be able for the present to increase, or even maintain, the strength of their effort in this field.

A number of writers—one group of them closely connected with the City and Guilds Institute—have set out their views in this issue. Their articles do not make up a planned symposium; nor on the other hand do they represent every possible individual view on the subject. But between them they cover a very wide variety of ideas and plans; and they show how widely discussion has ranged in this country in the last few years, and also how difficult it is to arrive at a final decision. So much depends upon judgment about the present position, educational as well as economic, of this country; and also upon inspired conjecture—for it can be no more —about where exactly our best industrial and commercial hopes and opportunities for the future lie.

A degree of general agreement

There is perhaps coming to be almost general agreement on three points: first, that so far as the first flight of pure scientists is concerned our national position is very strong, and that our strength here must not be unduly risked whatever we do; secondly, that in the top flight of applied scientists and technologists, including engineers, we are much weaker than we can afford to be, and that not enough young persons of first-class capacity are going into this

field; thirdly, that we are not giving a full-time training, on the basis of a broad college education but definitely somewhat below university standards as accepted and established in this country, to anything like enough young men for British industry and commerce.

On the credit side, there seems to be wide agreement that our universities have a confident philosophy and an assured function in the national life, which is not so evident either in America or in France and Germany; and that our well-developed and perhaps unique system of the training of technicians in part-time classes in local technical colleges is a great source of industrial strength. This part-time education, taken all round, is perhaps stronger than anywhere else in the world; the education of the top-flight scientists in this country is at least as good as anywhere else; and the education and training of applied scientists and technologists of degree standards—as understood in the universities of Great Britain—is not very different, one way or the other, from those ruling in America.

A question of man-power

The great question seems to be: where is the extra strength to come from in the two places where this country is weak—in top-flight applied scientists and technologists, and in fully trained technologists and engineers for employment at works level? For the first, it is doubtful whether, at least as far as boys are concerned, many more can be borrowed from the humanities in the universities. The boys' grammar schools have done a most remarkable job in the last quarter of a century in turning on to the sciences every boy of ability who could be so turned; it is doubtful whether there can be a very great many more to come. As for the second, the college-trained technologists for industry at works level, any access of strength here must surely come from among the very large number of young people who are at present receiving part-time training at technical colleges; and it would seem that these colleges, under one dispensation or another, must be responsible for their education.

In the meantime, we must not unduly weaken ourselves at our points of strength. We dare not risk our eminence in pure science. And we ought to consolidate and strengthen the ground we have gained in the education, mainly in the universities but also in many technical colleges, of full-time applied scientists and technologists of degree standards. Much has happened in this field in the last few years; courses of study have been largely re-thought, especially

in the technologies, and the quality of the students has sharply improved. Industry has as yet only begun to feel the impact of this development; meanwhile it is gaining in momentum, and if the necessary resources can be made available, its effects will be impressive.

Academic freedom in Australia

The following notes on recent academic freedom incidents in Australia have been received from a correspondent:

" Professor J. B. Cragg of Durham, whose appointment to the Chair of Zoology at Adelaide had been recently announced, withdrew from the post on discovering that the statutes of Adelaide University contained a clause restricting the political freedom of Professors. The clause states: ' No Professor shall sit in Parliament or become a member of a political association: nor shall he (without the sanction of the governing body) give private instructions or deliver lectures to persons not being students of the University '.

" It appears from statements in the Press by the Vice-Chancellor of Adelaide and by his colleagues that the clause is a long-standing one and has not been imposed as the result of any issue of current politics; a statute in almost identical terms has existed in the neighbouring University of Melbourne for almost 100 years, and it is stated that in neither University has the presence of such a restriction been seriously felt by members of the professorial staff among whose names have been many that have subsequently become well known in the British academic world (no such limitation is imposed on non-professorial members of staff).

" At the same time, the generally accepted Australian view that university teachers should not concern themselves in politics becomes evident in incidents which occur from time to time in all the universities, since in Australia a somewhat fierce glare of publicity beats even on academic classrooms and on the deliberations of university senates. Such an episode occurred in Melbourne simultaneously with the Cragg case, when the governing body of the University threatened to enquire into the action of three professors in addressing, during the recent referendum campaign, a meeting of students in the University who were urged to vote against the Government's proposals. Fortunately the Council of the University does not appear to have persisted in this course and the controversy has died away but the incident shows the risk to political freedom in

universities which, on the admission of one of the Australian Vice-Chancellors, have to be sensitive to the reactions of the Governments controlling their purse strings to statements on political issues by university teachers."

The issue of party membership

The same correspondent continues: "It is difficult in a country where the University Grants Committee constitutes an effective buffer between Government and a number of universities, to criticize the situation in another country where each Parliament governs an area containing only one university which therefore tends to be in a peculiarly close relationship to it; but it is surprising that Australian academic leaders should have acquiesced so long in this sort of restriction on their political liberty. Possibly a case can be made out for the ban on professors sitting in Parliament purely on the ground that the duties of a member of Parliament are incompatible with the full-time pursuit of another occupation: and indeed some university institutions both in Australia and in this country require a full-time teacher to resign or to take leave on his election to Parliament. But surely the prohibition of membership of any political party is indefensible and is out of place in the statutes of any great university. It appears at any rate to have been mainly a technical restriction in Australia where the academic economists in the thirties took an active part in promoting popular acceptance of the Premier's Plan, though without adhering to any political party."

Adult education in Scotland

For a variety of historical reasons adult education in the liberal studies has never flourished in Scotland as it has in England. It may be argued that in Scotland the excellence of all other forms of education is such that there is less need than in England for adult education. However this may be, it is encouraging to learn from the report for 1950–51 of the Glasgow University Extra-Mural Education Committee that there has been a considerable increase in classes and students. It is especially gratifying to find that of 137 classes for which the Committee was responsible 26 were three-year tutorial classes—a type of class often regarded in the past as an exotic growth hard or impossible to transplant from English soil. The university tutorial class is rightly thought south of the Tweed to be an essential part of any sound programme of liberal adult education.

I. THE UNIVERSITIES AND TECHNOLOGY

By C. R. Morris

Vice-Chancellor, University of Leeds

It is a fundamental principle of university education in this country that all sorts and conditions of young men and young women should live and be taught side by side. Can we afford that this principle, which has been so beneficial in our tradition, should not be applied to the higher technologists?

The benefit has of course been bought at a price, at any rate in the short term; and this price has been forcing itself more upon our attention in the last half century. Advances in knowledge in a scientific age may depend for their conception upon a mind with a catholic imagination and a wide memory, but they are made on an extremely narrow front. The faceworkers in their deep and cramping tunnels may lose the capacity and even the desire to communicate with one another. To speak less dramatically, each of them finds that he can only understand the preoccupations and hopes of his colleague working on another seam by the expenditure of an amount of time and energy which he feels he simply cannot spare from his own proper work—just as he cannot spare the time and energy to play first-class bridge or chess. He really thinks that by concentrating on less and less he will learn more and more. Or he is severely tempted to behave as if he did.

The value of concentration

Concentrated and feverish effort in the short term has always had a fateful attraction for the young student; but the university tradition in this country has always fought against it. *Maxima debetur puero reverentia.* The short years of undergraduate life are not just *any* years, to be treated without respect and used for any crass purpose for which a mere expenditure of so much time and skill will serve. Far too much is involved—for the young themselves and for the world. If the earliest years of life, spent in the home, are the determining years for temperament and character, and the next decade of life for the training of memory and simple skills; the sixth-form and undergraduate years—they are essentially one episode—are the years to learn the control of the power of intellectual manipulation and the harnessing of the imagination. They are years

too when it is still not too late to develop sensibility and human sympathy.

It may be said that this is all very well but we must face realities. We live in a hard world, and the price of success in it must be paid. We may no longer believe that for industrial greatness it is necessary to grind the faces of the poor; but it must be recognized that we must still sacrifice the young. The first-class violinist has never been able to afford an ideal general education; he has always had to devote himself to his craft. And so today must the high technologist; and those very sixth-form and undergraduate years are, as any experienced teacher can testify, the indispensable years for self-training in mathematics and the physical sciences. The hard fact must be faced that the young man destined for the highest technology must devote himself during these irreplaceable years to effort on a narrow front, and must quicken his progress by constant association with other young men of like special gifts and similarly concentrated purpose.

The British tradition

This is the main issue. In our own tradition we must answer—it is of our vocation as universities to answer—that to give way here is to buy a short-term benefit at a very great long-term cost. We have perhaps more than any other nation shown what can be achieved for the young, and through them for the world, by a rich school and university life. The Americans have recognized our achievement and have sought to turn its lessons to their own account. Not only have they set up far more universities and colleges than we have, but they have also concentrated more persistently—almost fanatically—on making them such that the young men and women are bound to live a full university and college life. They love the large university in the small town—with its own campus, its own theatres and concert halls, its own radio, its own police! They love the large college in the country. And many are the Americans today, both in industry and in the postgraduate schools, who will volunteer the information that the best young men in industrial affairs are tending to come from the middle-western and western state universities.

This is really *our* tradition, *our* lesson to the world; for though we developed it out of our study of the ancient Greeks, we added much that was our own, and the Americans have taken it from *us*.

Why is it so important? The answers are two, and really quite simple: first, that the sacrifice of the undergraduate years is an offence against the young themselves, and based upon a false philosophy of education; secondly, that for the preservation of the sanity of the world the workers in the front lines of original inquiry, and the students who will be among the leaders of the future in so many different fields, must live and work together.

The impact of university life

Something has already been said of the first answer; let us now for a few moments consider the second. After all, the triumphs of science and technology, brilliant as they will be, have to be fitted within the four corners of a civilization—and of a satisfying civilization, worthy of our respect. The philosophers, jurists, doctors, artists, administrators, executives, engineers and other technical experts have all to live together in twenty or thirty years time when they are at the height of their powers, and it matters very much that they should have some deep confidence that in forging ahead along their different roads they are all serving the same ends. They must be satisfied that they are putting together and sustaining a way of life which makes sense, and that this way of life is largely a triumph of their generation, arising from ideas and visions which it has shared and never entirely lost. All our British experience teaches us that the road of hope is to put our young men and young women of ability to live together in our universities, under conditions which will really make them live together and take fire in their minds from one another's insights.

The truth is that if the university is doing its job the scientific and technological students will absorb more of what they need of the humanities from their friends who are really students in the humanistic disciplines than they ever can by quasi-university extension discourses and classes, such as those which are imported as an *ad hoc* corrective to the highly technical curriculum of the Massachusetts Institute. It is no answer to say that our universities and colleges have fallen a little by the wayside from their own tradition, and that the " two worlds " do not live together as they should. We should feel sober pleasure that they have not, as in other places, fallen apart further; and we should note with pride that they are again living together today far more than they did even fifteen years ago, and that this change will go very much further

yet. This is to return to the heart of our own British secret, to reaffirm our own characteristic educational faith. If the brilliant inquirers of the next generation are to carry their technical triumphs like civilized and educated men, this is the way to go to work.

Technology as a university discipline

If these points be accepted on grounds of high principle, the last question must be faced: will the universities accept the call and undertake the job? After all they are established institutions, in high respect and of wide acceptance—the homes of learning, the most privileged seats of education, the guardians of standards. Will their charmed circles open to welcome new inquiries and as yet imperfectly established disciplines? Or will they remain intransigently conservative?

The modern universities—to go no further back—cannot fail to remember that it was in answer to a similar challenge that they got themselves founded. They dissented from the religious bars of Oxford and Cambridge, and they had some educational ideas of their own suitable to the industrial midlands and north; but more important always as a motive was the fear that the established universities were not prepared to offer a fairway for the march of science. They felt a call to fight for the cause of science, and they were at the same time convinced that it was by no means against nature for a university to welcome science and assimilate the scientist to the established community of learning. In fact, of course, the older universities heard the same challenge at much the same time and responded to it in much the same way. They asked themselves whether the inquiries of the sciences were suitable to a university, answered in the affirmative, and went forward in their support from strength to strength.

In practice the sciences brought with them medicine and engineering—mathematics of course was an old and respected inhabitant. There have always been medical men and engineers among the enthusiasts for scientific investigation, and these have always seen the need and value of " fundamental " enquiries, such as universities would be likely to foster. To the plain man today many parts of medical and of engineering science seem as " fundamental ", if not as " pure ", as many parts of physics itself.

The same logic which included engineering is now bringing in the so-called " technologies ". The basis in mathematics and

mechanics made the university the right place for the systematic study of the principles of man-made machines and engines; the basis in physics, with its electronic theory of matter, makes the university the right place for the systematic study of the structures of the materials, whether man-made or natural, on which the machines have to work. These technologies, with their fundamental scientific inquiries, cannot be separated from physics and chemistry. If they do not come to physics and chemistry, physics and chemistry will have to go to them. The study of protein molecules and of textile engineering must not be separated; and the instance could be multiplied a thousandfold. The advance of scientific knowledge pure and applied is indivisible; and the advantages of being together are by no means only one-way. If the old case for the unity in the university of the humanities and the sciences was well-argued, there is no choice left to make now. The technologies, as they show sure promise that they can come to maturity, must in respect of the study of fundamental principles come in at the same door.

The question of balance

The truth is that the universities—especially those universities which have some experience of the new studies—are in very large measure converted, scientists and humanists alike. Some of the technologies no doubt appeared to be very everyday, practical and unscientific affairs at first; but science, with its methods and its standards, has invaded them all along the line, and even in their undergraduate teaching they hardly yield to the pure sciences in their insistence on education in "fundamental" principles. In some respects indeed they are easier to assimilate into a many-sided community of learning than the physicists and chemists.

It is important that the position should not be represented as simpler than it is. Universities are bound in some measure to seek to preserve a balance between the different studies. Circumstances will differ of course between universities, and there may even be difference of opinion about the right principles of balance. Most English universities today have four parts—the humanities, the sciences, the applied sciences and technologies, and medical studies. In Oxford about three-quarters of the university are devoted to the humanities, in Cambridge about a half, and in most other universities about a third. It is possible that each university thinks that its own proportions as they are today are about right for itself and should

be maintained. But it may be that the more important issue affecting balance is whether students, and especially students of high capacity, are dividing themselves rightly between the pure sciences and the technologies. Certainly there can be no doubt that the distribution of students is in America much more favourable to the technologies i.e., to the schools of engineering—for all university students in technology are "engineers" at the undergraduate level—than they are here. Perhaps the Americans are in the right about this.

This is another question and cannot be followed up here. What matters for the moment is that considerations of balance are hardly likely to cause the universities to be unwelcoming to technological studies, provided those studies are concerned with fundamental principles and their students are up to the present recognized university standards. The more decisive question is, perhaps, will the welcome be vigorous enough? And will the vitality and ambitions of the new studies be accepted and nourished?

Here we have a cardinal point. There can be no doubt that to many English visitors one of the many attractions of a community like the Massachusetts Institute is its buoyancy, its absence of austere conservatism. The pure sciences are present indeed, but the tune is very much called by the applied sciences and technologies, which may have sometimes to compete for scarce resources but which in principle encourage one another to be enterprising. As for the humanities, with their timeless values and their natural fears of academic inflation, they are simply not there at all—except when they are brought in to give cultural lectures to the comparatively small number of undergraduates.

This question of buoyancy brings us to a parting of the ways. For against it rises the question of sanity and of faith. A closely organized team with a limited objective can perhaps achieve twenty-five years' worth of progress in five years; and in a war, this may be decisive. But if the members of this team continue in such work for too long, they will damage themselves as human beings; and this consideration too has its value. One of the lessons from the Greeks which we have in this country most taken to our hearts and made our own is the Periclean teaching that a democracy will of its nature hold on to the way of life of peace to the last moment, even though it may have to pay a price in the early stages of the next war. This is our way and the way of our universities. Is it really necessary that we should leave it?

II. THE HIGHER TECHNOLOGY

By Sir Frederick Handley Page

Chairman of Council, City and Guilds of London Institute

In the development of aircraft design and construction, a new science and technology has had to be built up, based upon fundamental teaching but nevertheless reaching out into new fields of academic and practical research and training. In the bringing together and expanding of the necessary technical staff, it has been necessary continuously to review the methods by which the staff have acquired their knowledge and experience, and above all to determine their attitude of mind towards the problems with which they are called upon to deal. This same need has no doubt arisen in other industries, but it has been particularly evident in connexion with aeronautical development owing to the high rate of technical progress forced upon it under the compelling needs of national defence in two world wars.

General principles

Out of such review some overall requirements are seen in regard to staffs.

First, the highest administrative posts should be held by men who have a good basic technological training so that they do not have to take important financial or technical decisions based solely upon Hitler-like inspiration or in entire dependence upon expert, and very often narrow, advice. Such training must be broadly based upon the humanities, but must finish with a graduate or post-graduate training in technology and in practical experience.

Secondly, in the highest technological posts the greater emphasis in training should be placed on scientific work in its application to industry and to practical development.

It is toward the aim of providing future candidates for the highest administrative posts and the highest applied scientific posts that the technological training in this country should be directed. In the past we have played a leading part—if not the leading part—in scientific research, but we have lagged sorely behind in the practical application and in the commercial exploitation of our scientific discoveries.

This technological training problem is no new one. Nearly eighty years ago the great City Livery Companies, associated with

the City Corporation in founding the City and Guilds of London Institute, pioneered the way and have since then taken an active part in providing facilities at all levels for technical and technological education. Granted a Royal Charter in 1900, it has the Duke of Edinburgh now as its President.

Based on this experience the Institute, at conferences with the Minister of Education and his officers in 1943 and 1944, made representations on technological education of university grade which it is believed influenced the appointment of the "Percy" Committee. More recently a deputation from the Institute waited upon the late Minister of Education and submitted to him the Institute's criticisms and constructive proposals on the Report of the National Advisory Council on Education for Industry and Commerce.

Four schools of thought

There are at least four schools of thought on the question of the provision of higher technological education. The first is represented by the proposals of the National Advisory Council on Education for Industry and Commerce, which were substantially accepted by the late Government. These include the establishment of a "College of Technologists" to approve courses at technical colleges, to grant awards, and to seek another Royal Charter. The second might be called Lord Cherwell's proposal for a number of new technological universities, somewhat on the model of the American Massachusetts Institute of Technology, or the German Technische Hochschulen. The third relies on an extension of the provision of technological education in the universities. The fourth, which the Institute has recommended, represents a compromise on the first and second schemes, and to supplement the output of the universities it proposes the upgrading of a few technical colleges with safeguards referred to below.

The Institute recognizes the importance of increasing the output of technologists of the highest grade in order to strengthen and develop our national industrial productivity. Considering the leading position this country still holds in the field of scientific discovery and in the education of pure scientists, it is important that we should also have men capable and willing to assure that we are in a position to utilize the results of our own researches, at least as well as any of our competitors. The rapid advance and the increasing profundity of science face us with technological problems

which can only be solved by men who themselves possess an advanced scientific education. It is wishful thinking to suppose that the industries of tomorrow, based as they will be on recent and future scientific discovery, can be developed by men who, like our forefathers, possessed only the personality and " know-how " for the simpler processes of their day.

Separate provision for full-time students

All the four schools of thought profess to be considering the education of technologists of university standard, although the first proposal retains these students in colleges, most of which have far larger numbers pursuing quite different courses, planned for technicians and craftsmen. For these and other reasons which are discussed below the Institute cannot agree that this proposal provides a satisfactory solution of the problem.

The Institute has throughout its history encouraged technical education for the latter type of student and today its major activities are concentrated on this important field. In order to keep in step with the progress in science and industry there is just as much need for advance in the education and skill of the technician as there is for the scientist and technologist, and for contributions in this direction the technical colleges are singularly qualified. Even if the segregation in different institutions of these two types of student is accepted as the ideal solution—and the proposal has the experience of Germany and other countries to support it—the provision of bridges to enable students of exceptional ability to pass on to institutions of higher grade right up to the university is most desirable.

The broadening and stimulating educational effect of changing from one institution to another is well known, but more practised in other countries than in our own; " sandwich " courses of industrial employment before or during the years of academic study have similar advantages. As another example of what can be done for encouraging technical college students of outstanding ability, the Birmingham University Industrial Scholarship scheme deserves mention. By co-operation between industry, the local authorities, and the university, a number of firms have provided scholarships for twenty-nine scholars and altogether forty-four have entered the university after technical college education, and a high proportion of them have obtained both honours and ordinary degrees. Special

initial coaching and the appointment of a tutor were found necessary to help these students to overcome their difficulties in dealing with mathematics and physics, required by them to fit in with the university courses.

It is a recognition of the importance of sound basic school and scientific education that appeals to the writer as one of the strongest reasons for segregating the higher grades of students from the lower. In consequence it is urged that a few carefully selected technical colleges should be up-graded so that they are indisputably of university standard. In many cases they could then be affiliated to universities in their region or achieve equivalent prestige on their own merit. Steps which have been suggested as necessary to this end are (*a*) a better and wider educational foundation of the student, thus raising the standard of entry to that of the universities; (*b*) a teaching staff with qualifications, status, and salaries at least equivalent to those of the universities and with industrial experience; (*c*) adequate provision of equipment and accommodation; (*d*) the transfer of teaching at lower grades to other institutions.

These objectives cannot be attained without much more freedom for the up-graded colleges than they could have if administered under local education authority and the Ministry of Education. Financial provisions, either direct from the University Grants Committee or from an analogous body, and governing bodies with experience in higher education and industry, are other prerequisites. The local authority, freed from the burden of providing for such up-graded colleges—national rather than local in the purpose they serve—would no longer have the embarrassment of their demands and needs competing with those of primary and secondary schooling and the education of technicians.

Most of the universities already provide graduate teaching in technology, although by far the greater part of this is in engineering. Since all higher technological education should be based on first-class science courses it is obviously in the universities that it is best located. Any outside institution which aspires to provide technological education of equal quality must also assure courses in pure science up to the university standards. This emphasizes one of the serious problems of up-grading of technical colleges, which needs to be faced. No comprehensive review of facilities in Great Britain for university technological education appears to be available. The provision varies greatly from one university to another and

apparently, especially at the older universities, hesitation and opposition are noticed when proposals for extensions in technology are suggested. The present national emergency appears to demand the full interest and support of all the universities in meeting the potential need of scientists and others able and ready to devote their services to our industries, on which the whole welfare of the country depends.

A problem both of quantity and of quality

It is difficult quantitatively to define what is required. So far as we can judge from other competing industrial countries, the proportion of honours grade technologists to pure scientists, instead of being 0.5:1 as in this country, ranges from perhaps 5 to 15:1. In any case it seems logical that if we are to apply the abstruse research discoveries of our scientists we may need to supplement each of them with a team of technologists capable of grasping the full import of their new ideas.

It is, however, mainly on the qualitative side that emphasis is needed. The recent Anglo-American Productivity Reports on *Education for Management* and *Universities and Industry** give up-to-date views of teams of representatives of wide educational and industrial fields who have studied these questions in the U.S.A. These reports give factual evidence for much that was already known about the large recruitment by industry in the U.S.A. for the past fifty years or more, of men of higher education.

If we consider the explanation these observers give that graduates in British universities should be compared with the first stage of post-graduate study in the U.S.A., our educational comparison relative to the size of our countries is not so weak as others have suggested. The percentage of students in different faculty subjects varies considerably in the two countries. Of greater importance in this connexion are the occupations which graduates enter. Whereas in this country the preference of university graduates, taken as a whole, might be said to be for the professions and the Civil Service, in the U.S.A. a high preference of graduates in almost all faculties seems to be for a commercial or industrial career.

A cause for this preference may arise from the aim towards which schools may direct the activities of their most promising students. The brilliant sixth-form boys with scholarships gained

* see page 183.

at universities give prestige and reflected glory on the schools from which they come and the staff, including the headmaster, by whom they are taught. Now, with the increasing administrative self-sufficiency of the Dominions and Colonies, there is a decreasing outlet for administrative officers trained mainly in the pure arts and cultural subjects. On the other hand, there is this increasing demand for technologists of the right quality. It is only by making initial success at technical colleges, upgraded to university level, to be of the same prestige value to the student's pre-college school, that the wholehearted backing of the school teaching profession will be secured.

The universities: Imperial College

It is beyond the scope of this article to attempt to do justice to the Faculties of Technology or other university co-operation in Manchester, Leeds, Birmingham, Sheffield, Glasgow, etc., but in some of these provincial universities provision is made for special branches of technology appropriate to their local or regional industries; for instance, the Textile Department at Leeds University in which the Worshipful Company of Clothworkers has taken a great interest.

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Here we have perhaps the nearest approach to the great technological institutions of foreign countries. Compared with these it is unsurpassed in the provision of basic mathematical and scientific education which, as stated above, becomes more imperative as the profundity of science and technology increases. On the technological side, moreover, a strong position has been attained, particularly in the engineering field. Full-time undergraduate day courses are given in the following branches: aeronautical engineering, chemical engineering, civil engineering, electrical engineering, and mechanical engineering. As an example of the specialist fields covered, the following post-graduate courses in the Department of Civil Engineering may be mentioned: concrete technology, highway engineering, hydraulic engineering and fluid mechanics, hydro-power engineering, public health engineering, soil mechanics, and structural engineering. In the Session 1950–51 there were 486 full-time undergraduate students and 462 post-graduate and advanced students in this City and Guilds College.

Another Department of the Imperial College, the Royal School of Mines holds a high reputation for its courses in mining and metallurgy.

Quite recently important new developments have taken place with the object of broadening the interests of the students. In co-operation with the London School of Economics a course for engineers and applied scientists on economics and administration has been established and special week-end conferences at the country estate of the College are being held with programmes of great cultural value.

Compared with the majestic size and equipment of some overseas technological institutions the Imperial College may appear small, but it forms the best prototype we have. It is no doubt quite capable of being transferred to another site and greatly enlarged and extended. Possessing as it does both the experience and the staff which are so essential to success, it presents great advantages over any alternatives that are sometimes suggested for starting quite new technical universities.

Whether or not the conclusions which have been put forward here are generally acceptable, it may be permissible at the end of this article to stress four basic observations. *First*, the school education of those entering the universities is admittedly far more advanced here than in the U.S.A. *Secondly*, we possess in our industrial research associations opportunities for both education and research in technology which are unique and are capable of affording service in introducing the science graduate to the realm of technology. *Thirdly*, we should be careful not to be too spellbound by the magnificence of buildings and equipment in these overseas institutions. As Professor Bertram Hopkinson stressed many years ago, more can be learned from the small plant specially selected to demonstrate principles than by installations of large modern equipment. Students should be made acquainted with the latest industrial equipment by works visits, and vacation employment, rather than expect to find it in their own colleges, which otherwise may become exhibition collections. *Fourthly*, the really important requirement is to mobilize a teaching staff possessing the rare qualifications for inspiring their students with the desire to carry forward the torch of our industrial pre-eminence lit many years ago, when Britain became the leader of the industrial revolution.

III. THE UNIVERSITIES AND HIGHER POSTS IN INDUSTRY*

By R. S. Hutton

Emeritus Professor of Metallurgy, University of Cambridge

The Reports of the Advisory Council on Scientific Policy[1] have emphasized that the industrial prosperity of the country, upon which the solution of our critical economic position depends, calls for improvements in our facilities for the application of science, to supplement our strong position in the prosecution of scientific research. These Reports also stress the need for technological education at a level which can only be carried out in the universities.

The recently published White Paper[2] stating the policy of the late Government on higher technological education, based on the recommendations of the National Advisory Council on Education for Industry and Commerce[3], concerns itself mainly with the sixty-six leading British technical colleges.

In many other occupations the need for classifying employment in different grades is clearly recognized. In the Services we have officers, non-commissioned officers and privates. In the Civil Service, administrative, executive, and clerical staffs, and scientists employed in Government service are divided into the scientific officer class, the experimental officer class, and the assistant class.

Educational standards of technologists

In technology, on the other hand, there is still no attempt to classify technologists into grades or even to distinguish them from technicians. This failure to define grades is the root cause of the wide diversity of views on technological education put forward in recent times. The Civil Service[4], both for its administrative and for its scientific officer classes, insists normally on a first or second class honours university degree, and the future requirements of industry at the top level should be for men of at least equal calibre.

* This article represents views held by one who, after a university education in England, Germany, and France, held a technological teaching post at Manchester University for eight years, followed by twelve years as director in a medium-sized industrial undertaking, twelve years as director of a Research Association, which brought him into intimate contact with leaders in both large and small concerns, and finally fourteen years as Professor of Metallurgy at Cambridge. During these periods several long visits to the U.S.A. and Continent were devoted to studying research and technical education abroad. Until recently he was Chairman of the City and Guilds of London Institute, a post he had occupied for ten years.

Whereas in the earlier stages of the consideration by the N.A.C.E.J.C. of the education of technologists, the standard of the first award was stated to be equivalent to that of a university honours degree, the final report omits the word "honours". Moreover, in these reports insufficient attention has been given to the vital necessity of insisting that to achieve these standards students on entry must have reached the Advanced or Scholarship grade in the General Certificate of Education.* Unless this is insisted upon we shall merely stereotype mediocrity and fail to provide technologists capable of maintaining our industries in the severe competition with foreign countries. Neither the Ministry of Education itself nor the Local Education Authorities have at present the staff and experience to deal with such education, which is clearly the province of the universities.

The main function of existing technical colleges is to provide the technicians and technologists corresponding to the intermediate classes in the scientific Civil Service. There is great scope for the development of such education to keep in step with advances in science and industry.

Technologists of high intelligence required

At the present time, and still more for the future, we need technologists of imaginative and creative intelligence, as these alone are capable of translating the scientific discoveries of the pure scientist and transforming them into the productive industry of tomorrow. The opportunities now available in our educational system not only provide facilities for the bright youth from all social classes to reach the universities, but will soon carry out this process so thoroughly that, unlike the old days, very few individuals of equal intelligence will be available for employment until after they have graduated. It is dangerous to look backwards and point out how many of our most successful business enterprises have been led by men who did not have the advantage of higher education.

Basic university education essential

Many solutions of this problem have been proposed, ranging from the establishment of new technical universities corresponding

* As Dr. Eric James, High Master of the Manchester Grammar School, points out in his recent book *Education and Leadership* (Harrap), high intellectual capacity, necessarily confined to a minority of the population, is an essential qualification for leadership.

to well-known foreign prototypes such as those at Zürich and Boston*, to the enlargement of the technological faculties of the universities. The universities, however, in some cases strongly oppose this latter suggestion, apparently from fear that it may lead to the development of vocational teaching in place of more basic disciplines, or from aversion to the unbalanced growth of any one faculty.

It has been made abundantly clear from the discussions at the Conference of the Federation of British Industries, and inquiries such as that of Cambridge[5], that the leading representatives of business look to the universities for an intensive intellectual education of students and not for vocational training. All agree that it is best for the universities to continue to plan and administer their own undergraduate courses with such changes from time to time as they consider desirable.

Wide attention has been given in recent times to the need for an increased supply of technologists of the highest grade, destined to occupy leading positions in industry. Only a few of our large modern business concerns possess adequate facilities for the full utilization of university graduates. Factories employing not more than 250 workers each are responsible for more than fifty per cent. of our industrial production. If these works recruit graduates at all they do so mainly for specialist jobs with limited prospects of attaining executive positions, although many examples could be quoted of the spectacular effect of the recruitment of a university graduate of the right type by a small business. The importance of increasing such a flow is clear, for all big industries start in a small way and experience of the value of the first recruit quickly leads to additional similar appointments.

For a big national industrial advance it is particularly the smaller concerns that deserve attention; with these a major difficulty arises from the difference in outlook and education of the employers and the average university graduates, but so far as the latter are concerned some remedy on the lines suggested below might be helpful.

* Before considering the establishment of replicas of such foreign institutions, it is important to realise that the structure of education, etc., differs widely from one country to another. In Great Britain our school education standard, our wide provision for technical education of craftsmen, and the availability of research associations covering almost the whole of industry indicate that we may need very different institutions to those found successful in America, Switzerland and elsewhere.

Others have dealt in this number with the importance of technological studies at the university level so that it is unnecessary here to say more about it. It is desirable, both for the employer and for the graduate recruit, that provision should be made to accelerate the latter's progress to a position where full use can be made of his capacity. It is rare to find in industry training courses to develop any special qualifications for leadership which such employees may possess; more often the earlier years of a young engineering graduate, for instance, are spent in acquiring machine shop or similar skills which the war-time experience of the Ministry of Labour showed could be acquired in a three-months' intensive course.

There is one direction, however, in which the present facilities for university technological education need consideration in order to assure that provision is made for teaching and research suitable for all branches of industry. At present engineering subjects occupy an overwhelming proportion of the programmes, and other technologies deserve increased attention.

Technology is not enough

A review of the industrial advance of some of the foreign countries competing with us shows that scientific research and technological education have both played an important part, but we are only just beginning to realize that other factors have exerted a predominant influence. " Scientific Management " introduced in America by F. W. Taylor about 1911, and " rationalization " in Germany after the first world war contributed greatly to the modernization of their industries. Both these developments depend on principles which were formulated by Charles Babbage, Lucasian Professor of Mathematics at Cambridge, as long ago as 1832, but they have awakened wide interest in this country only in quite recent times, and the British Institute of Management dates from 1947.

It is the top-management in business which designs the personnel structure of the undertaking and unless these leaders have the vision to appreciate the value of assistants of high intellectual calibre the scope of the enterprise is necessarily cramped. The proportion of men with academic education in American and German industry is quite unparalleled in this country, and it is not only from scientists and technologists that these staffs have been recruited.

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Educational standards of technologists

In technology, on the other hand, there is still no attempt to classify technologists into grades or even to distinguish them from technicians. This failure to define grades is the root cause of the wide diversity of views on technological education put forward in recent times. The Civil Service[4], both for its administrative and for its scientific officer classes, insists normally on a first or second class honours university degree, and the future requirements of industry at the top level should be for men of at least equal calibre.

* This article represents views held by one who, after a university education in England, Germany, and France, held a technological teaching post at Manchester University for eight years, followed by twelve years as director in a medium-sized industrial undertaking, twelve years as director of a Research Association, which brought him into intimate contact with leaders in both large and small concerns, and finally fourteen years as Professor of Metallurgy at Cambridge. During these periods several long visits to the U.S.A. and Continent were devoted to studying research and technical education abroad. Until recently he was Chairman of the City and Guilds of London Institute, a post he had occupied for ten years.

Whereas in the earlier stages of the consideration by the N.A.C.E.I.C. of the education of technologists, the standard of the first award was stated to be equivalent to that of a university honours degree, the final report omits the word "honours". Moreover, in these reports insufficient attention has been given to the vital necessity of insisting that to achieve these standards students on entry must have reached the Advanced or Scholarship grade in the General Certificate of Education.* Unless this is insisted upon we shall merely stereotype mediocrity and fail to provide technologists capable of maintaining our industries in the severe competition with foreign countries. Neither the Ministry of Education itself nor the Local Education Authorities have at present the staff and experience to deal with such education, which is clearly the province of the universities.

The main function of existing technical colleges is to provide the technicians and technologists corresponding to the intermediate classes in the scientific Civil Service. There is great scope for the development of such education to keep in step with advances in science and industry.

Technologists of high intelligence required

At the present time, and still more for the future, we need technologists of imaginative and creative intelligence, as these alone are capable of translating the scientific discoveries of the pure scientist and transforming them into the productive industry of tomorrow. The opportunities now available in our educational system not only provide facilities for the bright youth from all social classes to reach the universities, but will soon carry out this process so thoroughly that, unlike the old days, very few individuals of equal intelligence will be available for employment until after they have graduated. It is dangerous to look backwards and point out how many of our most successful business enterprises have been led by men who did not have the advantage of higher education.

Basic university education essential

Many solutions of this problem have been proposed, ranging from the establishment of new technical universities corresponding

* As Dr. Eric James, High Master of the Manchester Grammar School, points out in his recent book *Education and Leadership* (Harrap), high intellectual capacity, necessarily confined to a minority of the population, is an essential qualification for leadership.

to well-known foreign prototypes such as those at Zürich and Boston*, to the enlargement of the technological faculties of the universities. The universities, however, in some cases strongly oppose this latter suggestion, apparently from fear that it may lead to the development of vocational teaching in place of more basic disciplines, or from aversion to the unbalanced growth of any one faculty.

It has been made abundantly clear from the discussions at the Conference of the Federation of British Industries, and inquiries such as that of Cambridge[5], that the leading representatives of business look to the universities for an intensive intellectual education of students and not for vocational training. All agree that it is best for the universities to continue to plan and administer their own undergraduate courses with such changes from time to time as they consider desirable.

Wide attention has been given in recent times to the need for an increased supply of technologists of the highest grade, destined to occupy leading positions in industry. Only a few of our large modern business concerns possess adequate facilities for the full utilization of university graduates. Factories employing not more than 250 workers each are responsible for more than fifty per cent. of our industrial production. If these works recruit graduates at all they do so mainly for specialist jobs with limited prospects of attaining executive positions, although many examples could be quoted of the spectacular effect of the recruitment of a university graduate of the right type by a small business. The importance of increasing such a flow is clear, for all big industries start in a small way and experience of the value of the first recruit quickly leads to additional similar appointments.

For a big national industrial advance it is particularly the smaller concerns that deserve attention; with these a major difficulty arises from the difference in outlook and education of the employers and the average university graduates, but so far as the latter are concerned some remedy on the lines suggested below might be helpful.

* Before considering the establishment of replicas of such foreign institutions, it is important to realise that the structure of education, etc., differs widely from one country to another. In Great Britain our school education standard, our wide provision for technical education of craftsmen, and the availability of research associations covering almost the whole of industry indicate that we may need very different institutions to those found successful in America, Switzerland and elsewhere.

Others have dealt in this number with the importance of technological studies at the university level so that it is unnecessary here to say more about it. It is desirable, both for the employer and for the graduate recruit, that provision should be made to accelerate the latter's progress to a position where full use can be made of his capacity. It is rare to find in industry training courses to develop any special qualifications for leadership which such employees may possess; more often the earlier years of a young engineering graduate, for instance, are spent in acquiring machine shop or similar skills which the war-time experience of the Ministry of Labour showed could be acquired in a three-months' intensive course.

There is one direction, however, in which the present facilities for university technological education need consideration in order to assure that provision is made for teaching and research suitable for all branches of industry. At present engineering subjects occupy an overwhelming proportion of the programmes, and other technologies deserve increased attention.

Technology is not enough

A review of the industrial advance of some of the foreign countries competing with us shows that scientific research and technological education have both played an important part, but we are only just beginning to realize that other factors have exerted a predominant influence. " Scientific Management " introduced in America by F. W. Taylor about 1911, and " rationalization " in Germany after the first world war contributed greatly to the modernization of their industries. Both these developments depend on principles which were formulated by Charles Babbage, Lucasian Professor of Mathematics at Cambridge, as long ago as 1832, but they have awakened wide interest in this country only in quite recent times, and the British Institute of Management dates from 1947.

It is the top-management in business which designs the personnel structure of the undertaking and unless these leaders have the vision to appreciate the value of assistants of high intellectual calibre the scope of the enterprise is necessarily cramped. The proportion of men with academic education in American and German industry is quite unparalleled in this country, and it is not only from scientists and technologists that these staffs have been recruited.

The great extension in the American universities of graduate schools of business administration, several of which have attained recognition as of high academic quality, has provided the United States with recruits who are largely responsible for the success of its industrial enterprises. In our own country it is only now becoming more widely recognized that for industrial leaders qualifications are called for additional to those possessed by many of our graduates in science and technology.

Some years ago Sir Henry Bunbury, then Comptroller of the Post Office, dealing with the same subject, aptly remarked: "The business of the administrator is not himself to be, let us say, an economist or a politician, but to be able to judge between them and to know the merits and perils of each. He is a man of high intelligence and sound judgment, who 'knows when he does not know and then calls in those who do'." Lord Hankey, in a recent valuable review of "Higher Technical and Scientific Manpower"[6], has drawn attention to the disturbing frequency with which "officer qualities" of leadership and character are lacking in men who have taken higher educational courses. He suggests that administrative staff courses somewhat on the lines of those which have been so successful at the Imperial Defence College might prove helpful.

Some provision already exists for business men at the Administrative Staff College at Henley and the London School of Economics, but these are both of the nature of refresher courses taken at a later period in a man's career. In addition, the London School of Economics, in co-operation with the Imperial College of Science and Technology, has organized an undergraduate course for engineering and science students.

For two main reasons these, although of value, do not appear to be the ideal solutions to our problem. The undergraduate course is too early and the refresher course too late. The short normal period of three years devoted to undergraduate study scarcely leaves room for adding extra subjects. The major problem is to attract graduates of high intelligence to industry in competition with the Civil Service and the professions.

Postgraduate courses as bridge to careers

We need to consider how the universities themselves can prepare men for more ready acceptance and better prospects of advancement

in business. This can be done in two ways: first, by the teaching staff and tutors themselves appreciating that employment in industry offers unsurpassed opportunities for creative initiative and quite as worthy a career as the Civil Service or the professions, and secondly, by providing special post-graduate courses to bridge the gap between the academic and the business world. The period immediately after graduation is consequently the right moment and this contention is borne out by the American experience, for there the majority of students in post-graduate schools of business administration enter them immediately after graduation.

Some of our universities may hesitate to develop such courses but there are two strong arguments which might be put before them: the urgent national importance of the new industrial revolution with which we are faced and the fact that for quite similar purposes they have already established courses which have a like objective. The Oxford, Cambridge and London universities are co-operating in a post-graduate course for recruits entering the Colonial Service which has the following defined purpose:—

> "To give the cadet a general background to the work which he is going to take up; to start him with a proper sense of proportion; to show him what to look out for on his apprentice tour and the significance of some of the things he may expect to see during it; and to give him the minimum of indispensable knowledge on which to start his career."[7]

If the universities can provide such service for our colonial interests it should be possible to justify equal opportunities of preparation for positions in our home industries on which the welfare of the country more surely depends. It is suggested that a well-planned post-graduate course would give a valuable introduction to many careers, particularly to those in industry and commerce, and would enable graduates to make much more rapid progress than many of them are able to do at present.

The plan of such a course obviously needs critical consideration but the following is put forward to encourage such criticism and, particularly, to point out some of the essential studies needed to supplement those which have been taken in undergraduate honours schools. These have as their object a broadening influence and an academic foundation to subjects which ultimately play such an important part in the commercial and industrial world. Such a

course might with advantage occupy a full academic year or might be tried in an intensive form during the long vacation.

1. Economic financial problems of modern industry. This course would introduce students to the fact that in business (commerce and industry) problems of capital and expenditure, as also costs and time factors, often exercise a controlling influence.

2. Problems of industrial relations including industrial psychology and other basic considerations of the human factor in industry.

3. Systematic instruction in the use of libraries and information services, with the object of enabling the student to explore and utilize subjects outside those he has previously pursued.

4. A seminar course to educate students in presenting both oral and written reports, particularly on specialist subjects, in different forms suitable both for other specialists and for those who have to base policy on well summarized and clearly explained data or situations.

This article was written before the author had access to the important reports of the Anglo-American Council on Productivity,[8] the contents of which give most valuable factual information on the development of this subject in the U.S.A. The Conference of the British Institute of Management held at Harrogate on November 15–18, 1951, also provided important contributions, in particular, a discussion led by Mr. C. R. Morris, Vice-Chancellor of Leeds University, on the employment of the arts graduate in management.

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IV. TECHNICAL EDUCATION FOR THE SUPERVISOR, CRAFTSMAN AND OPERATIVE

By Cyril Lloyd

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The personnel engaged in technical work in industry may broadly be divided into two categories—the professional and sub-professional. Both are of equal importance in our national economy and in most industries they together form teams of which a characteristic feature is mutual confidence in each others' skill and knowledge. The professional group includes the scientist, the technologist, and the future higher management staff, and it is mainly with these that two of the other articles in this series have dealt. The education of this group is necessarily full time and carried out at universities and technical colleges.

The sub-professional group

This article will deal with the education of the sub-professional group and the work of the City and Guilds of London Institute in connexion therewith. Within this group may be distinguished three main types of technical worker. Of these the operative is a semi-skilled industrial worker who has a limited technical task to perform with a correspondingly limited requirement of basic scientific knowledge and mechanical skill. The craftsman, sometimes called the tradesman, mechanic or artisan, is another type who requires some general scientific training but primarily a thorough knowledge of his materials and considerable skill with his hands in fashioning them to his needs. Lastly there is the technician, who requires a general scientific training of some depth to enable him to understand the reason and purpose of the industrial processes with which he is concerned, but who is in consequence competent to supervise others in carrying them out.

On leaving school at fifteen or sixteen these workers usually go straight into industry and embark on an apprenticeship or equivalent form of training lasting some five years, during the course of which education " on the job " is supplemented by courses undertaken at technical colleges in the evenings or during day-release. The courses

in the colleges are closely related to the needs of the industries of the locality but are often included in a regional or national syllabus or programme.

The bodies concerned with the evolution of courses and the provision of certification are the City and Guilds of London Institute and the four regional examining unions (The Union of Lancashire and Cheshire Institutes, The East Midland Educational Union, The Union of Educational Institutions and The Northern Counties Examinations Union). Between these there exists a cordial relationship which results in a free exchange of information and complete agreement as to the scope of the activities of each.

When an approach is made to the Institute for the establishment of a syllabus in a new subject an exploratory committee is set up to go into the matter and to state a case. In the construction of such a committee very great care is taken to ensure that all relevant interests are represented. The membership covers the technical colleges, both sides of the industry concerned, expert technological interests or individuals, the Ministry of Education, local education authorities, the universities and so on. If a good case is made out, the committee usually proceeds to evolve a syllabus and a related system of examinations and certificates. Ultimately a report is made to the Examinations Board and thence to the Technology Committee of the Institute. When the report is accepted, with or without modification, the syllabus is incorporated in the programme of the Institute and is then given the widest possible distribution to all institutions and firms likely to be interested. Adoption is a local concern but, since all interests have been involved in the construction of the course, is usually automatic if it is relevant to local needs. The exploratory committee is converted into the permanent advisory committee of the Institute for the subject concerned and thereafter exercises a controlling influence over its subsequent progress. It proposes examiners, moderates examination papers, the marking of scripts and practical work, and keeps the syllabuses under constant review.

Growth of the Institute

The growth of this work in recent years has been literally enormous and the Institute now has nearly one hundred advisory committees embracing some two hundred technologies or crafts. As shown below, nearly 80,000 candidates entered in 1950 for the Institute's

examinations in these subjects, and it has been estimated that the total number of students pursuing courses based on the syllabuses of the Institute amounts to over 600,000. In certain major fields of industry the Institute has recently established consultative committees which survey a wider field than can be covered by any single expert advisory committee. Examples are the consultative committees for the printing, electrical and building industries. The purpose of these committees is to examine the whole field of the industry concerned, to identify gaps in existing provision for training or cases in which closer liaison might be established between courses to achieve more effective results, and to advise on the validity of the approaches made to the Institute for new courses.

For the craftsman and technician the average course is one of four or five years' duration on a part-time basis and with a practical bias. Two examinations are arranged during the course; the intermediate is usually held at the end of the second year and the final at the end of the fourth or fifth. The intermediate represents an adequate standard of attainment in a craft or trade, and the subjects basic thereto, but further experience and knowledge are required for full competence. In the area covered by a regional examining union the Institute accepts an equivalent examination of the union concerned as exempting a candidate from the intermediate examination. The final represents high competence for all normal purposes in the craft or technique and subjects basic thereto. Given the right qualities of personality and character, the holder should become a capable foreman or supervisor.

The Institute also offers a certificate called the " Full Technological Certificate," the requirements for which ensure that the holder, in addition to completing the prescribed studies and final examination, possesses a satisfactory knowledge of allied branches of science and art. This certificate is well known, and widely sought, as a hallmark of competence in most of the technologies and crafts; 1,424 of these were awarded in 1950.

Courses for the operative

As has been mentioned earlier the operative has a more limited requirement of knowledge and skill than either the craftsman or the technician and the courses providing for his needs are neither so long nor so wide in scope as those described above. The desirability of courses for this class of worker has only been made

apparent comparatively recently and has been brought about largely by the extension of mass-production methods in industry. These courses are not only important in themselves but they also help to bring into the field of the qualified technical practitioner a class of person who may thus be encouraged to seek a higher qualification of greater value both to himself and industry. Operatives' courses have already been established for many technologies and there are signs that the immediate future will see a great increase in their number.

Since the war the increase in the number of candidates sitting for the examinations of the Institute in the sub-professional field has been very large and reflects the growth and development of industry itself. In 1945 the total number of candidates in all subjects was 32,000 and this has risen in 1951 to 77,000. The rate of increase cannot continue at its present high figure and there are signs that saturation point is being reached in existing subjects although the large number of new subjects now being developed will bring about further increases as they become established. The field covered includes the whole of industry on the technological side and extends also to women's subjects and the provision of teacher's certificates in domestic subjects, cookery and handicraft.

Subjects and examinations

In the space available it is impossible to give a full list of all the technological subjects covered by the Institute. Programmes have been published for the following groups of these subjects which give full details of the regulations, syllabuses, etc., of each individual subject, and the annual reports of the Institute and of its Department of Technology should be consulted for an account of the whole field of the Institute's activities.

The following summarized data give the number of examination entries for these groups in 1950, and in the second column the number of full technological certificates granted in these groups.

It may be interesting to note that of the total number of candidates, about 20 per cent. obtained first class and 34 per cent. second class, 9 per cent. ordinary passes, and 37 per cent. failed.

The further analysis of these groups under individual subjects shows how wide a field is covered, for there are some 160 trades dealt with.

Subject Groups	Total Examination Candidates	Full Technological Certificates
Chemical, Metallurgical, etc. ..	4,415	46
Textiles	5,573	316
Telecommunication and Electrical Engineering	33,775	86
Mechanical Engineering	9,749	217
Building subjects	14,668	581
Food technology	4,335	27
Artistic subjects	2,415	125
Miscellaneous subjects	1,812	21
Needlecraft	1,839	5
	78,581	1,424

All these courses are dealing with well defined specific branches of applied science, in which materials and processes need to be studied in detail. The comparison with technological studies in the universities is striking, for there probably more than three-quarters of the students are engineers and it is only rarely, if at all, that one finds other fields of applied science dealt with. It is obviously the function of university courses to concentrate their attention on the fundamental principles of applied science and on research, and viewed in this way it is true that university trained engineers can cover a high proportion of our industrial needs. With the growing importance of the applied chemical, physical, and biological sciences there would, however, appear to be need for the extension of the university technological studies in other directions.

Overseas development

The examinations are held annually at over one thousand centres at home and abroad. The post-war development overseas has been remarkable and the influence of the Institute now extends to almost every part of the Commonwealth, Empire and Mandated Territories as well as to many foreign countries in which the work can be carried

out under the ægis of the British Council. This work is, in fact, one of those unofficial activities which do so much to link this country with countries overseas. Connected with this is the considerable amount of advice which is given to individuals and organizations on matters connected with technology. It is not too much to say that the Department of Technology acts as a general clearing house and information centre for technological education for individuals, colleges and firms at home and abroad. As an example of this the principal of every new technical college established in the colonies and dependencies since the war has visited the Institute for advice before taking up office.

The system outlined above has been found to work extremely well and it has been planned to be as flexible as possible so as to meet the changing needs of industry. Close co-operation has been achieved in all the subjects with individual employers and workers, and with the educational world; for the Ministry officials, teachers and directors of education serve on the Advisory Committees, the Examinations Board and the Technology Committee itself. The independent status of the Institute has advantages which are appreciated by all the interests, official and otherwise, which join with it in pursuing the common aim of assuring a well planned programme of technical education. It may be said with truth that the provision of education for the operative, the craftsman and the technician is a vast co-operative effort characterized by the greatest goodwill. Moreover, it should not be forgotten that in addition to the bodies mentioned, the founder constituents—the City Corporation of London, the City Livery Companies, the professional institutions, and a large number of public spirited individuals—all make their contribution of expert advice and guidance and from these wide resources the unique structure of the Institute's work has been built up.

The future

It now remains to give some idea of the developments which the Institute has on hand for the immediate future. New subjects are constantly being recommended for adoption and of these there are at the present time about forty under active consideration, ranging from Furnace Brickwork to Leathercraft.

It has for some time been realized that organized provision is lacking both for instruction and examination in Agriculture at levels

comparable with the craftsman and technician in other industries. It is now justly recognized that the agricultural worker is a highly skilled craftsman or technician and the Institute is at present actively engaged in a project, not necessarily involving examinations, to ensure that the provision of part-time agricultural education is adequate for modern needs.

Another development of considerable interest and great importance is that in connexion with the certification of technical teachers. Up to the present the Institute has provided this for Handicraft and Domestic Subjects only. It is now realized that these are special aspects of a much more general need. Parallel with the recent establishment, by the Ministry of Education, of colleges for the full-time training of technical teachers, the Institute is now concerning itself with the provision of part-time courses and related certification for the very large number of individuals who teach in technical colleges on a part-time basis. This is a matter of first-class importance and considerable progress is being made in close collaboration with the Ministry of Education and all other interested parties.

The " insignia " award

Finally, the Institute has for some time been concerned with the provision of an incentive for a type of worker who is of the greatest importance to industry. This is the worker who has potentialities beyond the " skilled " level, either intrinsically in his own technique (which he is capable of taking to the highest level), or in his ability to apply his knowledge to improve and advance industrial methods. He himself naturally wishes to be qualified for personal advancement in industry, but has in the past found no suitable recognition or higher award for which he could compete, and he seems to have been overlooked in the evolution of schemes of training in industry. Many believe that present educational arrangements over-emphasize the academic as distinct from the practical in offering facilities for the advancement of this class of industrial worker. The Institute has decided to provide workers having these potentialities with an appropriate incentive to reach greater and more general competence by establishing a high " insignia " award. The general conditions for the award, which are given below, indicate its scope and character.

The Candidate must (*a*) be at least 28 years of age; (*b*) have completed an approved course of practical training in some branch

of industry; (*c*) have had an acceptable general, scientific and technical education and have passed final examinations of the Institute in subjects appropriate to his branch of industry; (*d*) have had at least five years suitable industrial experience after the completion of his practical training. These conditions having been fulfilled he must also satisfy the Institute that he possesses to an outstanding degree breadth of practical experience and knowledge concerning his branch of industry, appreciation of the basic scientific principles governing the branch of industry concerned, and capacity for taking responsibility and for leadership.

The detailed regulations for this award are now being brought to a decisive stage and it is confidently expected that its establishment will go a long way towards encouraging those in industry for whom an academic award is not appropriate but who have, through their ability and practical performance, shown themselves deserving of recognition and distinction. It is also hoped that this award will do something to provide a bridge between the sub-professional and professional classes, the need for which has so long been recognized.

The Institute, through its appropriate committees and its permanent staff, has problems of the kind mentioned above under frequent consideration, and being in the closest touch with industry on the one hand and the educational system on the other, endeavours to take a realistic view of the situation. It is ever on the lookout for tendencies in education and in industry and endeavours at all times to exert its influence in the direction of the greatest good for the nation as a whole, for which, at the present time, an adequate system of technical education is vital.

V. THE UNIVERSITIES AND POST-GRADUATE COURSES IN TECHNOLOGY

By J. F. Baker

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Whatever experiments are made in the education and training of technologists, the universities will continue to play an important part. They must take an even keener and more active interest as the responsibilities and value of this section of the community come to be more generally appreciated. It is well, therefore, for the universities to keep their own aims and methods under review.

Specification for a technologist

The specification for a technologist, defined as a man who can deal with tomorrow's industrial problems, improving old processes and inventing new ones, is rigorous. He must have a sound grounding in a wide field of fundamental sciences, be a considerable mathematician, have undergone the discipline of dealing with particular problems in detail and with accuracy but know when his passion for exact results must be curbed in the interests of practicability. He must also have at least a sufficient knowledge of today's methods, techniques, processes, tools and materials to be able to collaborate with the technician. He must be a man of character, since the fact must be faced that in improving old processes and methods and even in inventing new ones he will not, in British industry to-day, always be popular and have his own way. He must also be potentially an administrator and be, in fact, an educated man.

Alarming though this list is, it contains much that our universities are pre-eminently fitted to give, though, in the opinion of some reactionaries, they should do so to all but the technologist. The universities can, and do in many places, give them to the technologist also, though he, perhaps more than the members of other professions, needs a great deal more besides.

The universities are successful in giving students the necessary grounding in the fundamental sciences and mathematics and in subjecting them to the intellectual discipline of dealing with more academic problems. Nowhere else can they be given, with such

certainty, so sound an all-round education, forming character and making them fit for responsibility and leadership. No more could be forced into any young man in a three-year course.

Technology and the natural sciences

It is sometimes suggested by the reactionaries that, as the emphasis is on fundamentals, the universities could avoid the embarrassment of dealing with technologists by disguising them as natural scientists. The contents of undergraduate technological courses may not differ radically from those in pure science, but there must be a difference in approach and in the attitude of the teacher. Students of technology, or at least of engineering, the branch most widespread in the universities, must be taught by engineers even in their undergraduate years.

This is not as easy as it sounds because of the difficulty the teacher has in retaining the attitude of mind and maintaining the experience which will keep him an engineer, a difficulty found in any teaching institution, be it university department, technical college or even "technical university". It can be overcome but it needs determination. The university can help, as many do, by encouraging applied research which necessitates close contact with those in industry who will help to develop and apply the results. Another way is to encourage rather than merely to tolerate consulting work. This is a common practice in Continental schools and in America and one that could be more widely adopted with advantage. It attracts to the teaching staff lively and distinguished men who, however anxious they may be to teach, are fearful of losing touch with practice. At its best, when only highly original problems are undertaken, it is one of the most effective ways of maintaining a vigorous school. The objection usually raised is that the consultant will tend to neglect his teaching duties. Experience shows that the successful and therefore energetic man is less likely to do this than others. Even if he is numbered among the small minority, found in every faculty, who put their personal interests before their university duties, surely it is better for him to do so as a result of preoccupation with his profession than with his garden or golf course. There is another reason why the universities, by allowing the use of testing equipment and other laboratory facilities, should actively encourage their teaching officers to prepare designs and schemes to the finished state where industry can make direct use

of them. The more original the advance a man makes by his researches, in such a complicated subject as applied science, the more difficult does its adoption become. Publication can be as wide as possible but designers in industry, particularly in the older branches, will be reluctant to apply the new knowledge and happy if everyone can cling to the old. The only practical way of taking advantage of the advance is to allow the man originally responsible, who has the confidence and knowledge, to carry out work for any client bold enough to employ him. When the outcome of the research has been demonstrated successfully and experience of its application obtained, other designers will soon overcome their reluctance and the community will benefit.

The university technologist and industry

A shortcoming of many departments of technology has undoubtedly been this tendency for the teacher to become too academic. Everyone has a strong innate desire to escape from practical difficulties. An immediate result is that the real research problems of technology are neglected for the academic, which most authorities seem to consider more creditable. The universities, at least, must learn to honour the applied scientist's real work—the application of knowledge and the presentation of the results in a form which industry can use. It is often arduous and always responsible work which must, in general, be carried out under the control of the man who has the first original idea. The universities have a duty to encourage these activities, quite apart from their duty as teaching institutions. Conditions may be more difficult than they were forty or fifty years ago; industry and research institutions admittedly hold a wealth of knowledge and a mass of apparatus, but the university departments of technology in close contact with the science departments still have great advantages. The use they have made of them in the past thirty years is not insignificant and they can do more.

To return to the student: having spent three years in an academic atmosphere, he should be turned out into the world. This is hard on those departments which like to keep their brightest students to do research and, by comparison with the pure scientist who will proceed to a higher degree and an immediately higher status, it is hard on the student; but the technologist will have realized by this time that he has to face a harder life. Though the world gives

him less rather than extra credit the more difficult path cannot be avoided. He, unlike the average scientist, has to make his way in the real world of industry and no educational institution, however full of machines and techniques and mock practice, can reproduce the industrial atmosphere and the real problems which must be met before the young man is fitted for the final stage in his formal education. He must, therefore, go from the university to serve an industrial apprenticeship. This should be as short as efficient planning can make it. Most branches of industry have much to learn in planning suitable courses for university entrants.

After acquiring some knowledge of present-day methods the technologist must continue to be employed in industry for a few years while he learns its problems, finding, incidentally, that the approximations which must be made are not always the easy and obvious and, in fact, that it is not a straightforward matter to apply the fundamental sciences to improve old processes and invent new ones. Then these men, or at least the relatively small proportion who have, under industrial conditions, given some indication of a flair for original thought and action, are ready to embark on a postgraduate course of instruction in the science and art of applying science.

New university courses

Some of the newer and better organized industries themselves and some colleges have provided such courses for years past. The University Grants Committee, realizing that all branches were not covered, have during the past two years made it possible for each university department which is actively engaged in furthering engineering research to pass on its knowledge through courses of instruction to postgraduate students. These facilities have not been given to every department but to a selected few which have something to pass on not obtainable elsewhere. The young man's experience in industry will have concentrated his attention on some relatively narrow field. His firm will choose that university which has active work in progress in that field and will send him there for a year, not to do research but to attend advanced lectures, to read under the supervision of men who have made themselves experts, to engage in laboratory work under conditions not usually available in industry and, above all, to learn how to apply science.

The courses recently instituted are at

Birmingham University . .	Chemical Engineering. Metallurgy. Theoretical Metallurgy. Mechanical Engineering.
Cambridge University . .	Chemical Engineering. Civil Engineering (Materials and Structures).
Durham University (King's College, Newcastle-upon-Tyne)	Agricultural Engineering.
Edinburgh University . .	Electronics.
Leeds University . . .	Textiles. Fuel Technology.
London—Imperial College .	Chemical Engineering. Civil Engineering. Electrical Engineering. Mechanical Engineering. Mineral Dressing.
Sheffield University . .	Mechanical Engineering (Applied Mechanics). Metallurgy. Mining.
Glasgow University . .	Mechanical Engineering (Thermodynamics).

It will be seen that many branches of technology are not included in this list. All could, however, be covered if the scheme were extended to the research institutions in this country. In addition to the National Physical Laboratory and the other Government Research Stations coming directly under the Department of Scientific and Industrial Research, there are 42 industrial research associations which cover every branch of technology. No other country has anything like these research associations and, though some of them have provided courses of instruction from time to time, there seems to have been no attempt to use them to the full. It is pathetic to hear of efforts to found specialist departments in universities to teach Building Science or Road Engineering, for instance, when the latest knowledge in those subjects is concentrated at the Building Research Station and the Road Research Laboratory. If the staffs of any of these forty or so institutions were increased by only two

or three officers, courses could be organized in a matter of months for the relatively few high calibre students who would come forward for each course. Here are the constituent " colleges " of a British " technical university " which could be turning out their first students after a year's course in June, 1953, at a cost quite insignificant compared with that of the foreign type of institution of which so much has been heard in recent months.

While all available specialist knowledge must be mobilized for postgraduate courses, it is important to notice that the scheme outlined above for the universities is carefully integrated. Primarily in the interests of the undergraduate courses, the teachers must engage in research and other practical activities. When that work makes them leaders in their particular field they must be given extra facilities to enable them to take postgraduate students. These students will be mature men coming straight from industry. They will contribute, by their keenness and practical aims, quite as much as they receive so that both the department's research and undergraduate teaching will benefit, neither will become too academic, and a healthy, balanced state will develop.

THE UNIVERSITIES AND SELECTION

I

By T. J. P. York

Headmaster, Merchant Taylors' School, Crosby, Liverpool

All are agreed that the first duty of the universities is to the small minority of the population with high academic ability. This minority, to a great extent, selects itself; but, because of the many variable factors in the upbringing and education of boys and girls, it is necessary to include in it some with doubtful credentials. Schoolmasters must very rarely feel that anyone capable of approaching the highest level of attainment is in danger of being missed by the universities, though Mr. Churchill still at Harrow might perhaps again have stumbled over the matriculation requirements of the ancient universities.

The real problem of selection is with candidates beneath those of the highest level of academic promise, and trouble in the past has arisen partly because of the failure to discriminate between different types of entrant. Methods appropriate for determining the level of ability and achievement of candidates, whose claim to university places rests on their qualifications to belong to the academic élite, have too often been applied mechanically to all entrants.

The Vice-Chancellor of Reading points to the fundamental difficulty when he writes: " Selection for universities will never be properly based until we have decided what universities are for." Broadly speaking the writers of the November articles in the *Universities Quarterly*—and past practice—seem to indicate two main groups for whom universities accept a secondary responsibility, those who are mainly concerned to obtain a vocational training and among whom will be many of the highest level of academic ability—the doctors, engineers, architects and so on—and those below the highest level, who, by reason of spending three or four years at a university, are likely to be better men, better able to serve society in a variety of functions for which their university course is in no sense a specific training.

It is unlikely that a better instrument of selection of those most suited to fill the places in the universities available for these two groups of students than the traditional one of the interview will soon be found. But before the interview can produce satisfactory

results a number of conditions must be fulfilled. First, the interviewers, and those by whom the interviewers are entrusted with their task, must accept frankly that they are looking for personal qualities in addition to academic ability and promise. Here comes the complication that under present conditions the interviewers are acting, in effect, not only for their universities but often for bodies responsible for making grants of public money to those whom they accept. Where such grants are made, the basis of allocation of university places must not only be fair, but seem fair and intelligible to outside critics. The old basis of award of State and Local Authorities' scholarships and grants on Higher Certificate marks was certainly impartial, and it had a spurious appearance of simplicity which secured for it public confidence. The high reputation for integrity of British universities and the prevalence of selection by interview for many purposes ought to prevent selection of university entrants by interview from being seriously suspect. Secondly, the interviewing boards must contain representatives of more than one interest. As Professor Pascal points out, if a university department has unfettered control of its entries, it is almost inevitable that the candidate's probable performance in a Final Examination shall be regarded as an absolute test of his suitability. Selection through the college tutor, as at Oxford or Cambridge, is less prone to one-sidedness. Thirdly, the interviewers should give full weight to the candidate's school record and the confidential opinion of his schoolmaster as well as to their own impressions and to his examination results. To ask for this is not to claim for schoolmasters infallibility in discerning which of their pupils most deserve as national investments the opportunity of university life, nor to ignore the unreliability of some school reports. The reports will, however, become increasingly valuable as schoolmasters gain confidence that they are regarded by all universities as being of real importance. A headmaster is not likely to take much trouble over a document which he thinks may have no more significant fate than to be filed—and perhaps mislaid—by a clerk in the Registrar's Office.

There is no clear standard by which the eventual success of the candidates chosen can be judged. There is no handy yard-stick within even the limits of one occupation, no easy way of classifying into neat categories, which can be correlated with interview marks, the degree of success or failure of a middle-aged schoolmaster or a

university lecturer; still less is there any way of comparing achievement in the wide range of jobs to which men pass from the universities and of weighing their comparative importance. But because the task is difficult it must not go unattempted. There are at any rate two categories of short-term failures, which deserve careful consideration, those who after entering a university fail to stay the course, and those who after obtaining their degrees fail to find appropriate employment.

The border-line candidate

A satisfactory technique of selection must not make too great demands upon the time of either university officials or schoolmasters, and it must be devised so that most of this time is given to the consideration of candidates in the doubtful borderline group. Some way must be found of meeting the artificial inflation of the problem by multiple entries. On the one hand some Faculties complain that their officers are overwhelmed by the number of applications that they receive; on the other the general impression of the schools is that most undoubtedly suitable university entrance candidates get in somewhere. But the schoolmaster knows that his weaker university candidates apply to four, five or six universities; and it is difficult for him to discourage the stronger candidates from doing the same thing, if they are anxious—it may be quite unnecessarily—about the results of their applications to their universities of first or second choice.

Nervousness about the effects on university autonomy of any centralized machinery for dealing with applications is apparent in the November articles. But it ought not to be beyond the ingenuity of administrators to devise arrangements which would safeguard both the freedom of choice of the universities and of the applicants. This is not the occasion to expound the suggestions for a Universities' Admission Board already formulated by the Headmasters' and Headmistresses' Associations with these ends in view. But the problem of selection has now reached such dimensions that it seems to the schoolmaster that without efficient—and probably centralized—administrative machinery the stage can hardly be reached in a large university department, for entry to which there is serious competition, where careful and extended consideration can be given to claims of the critical borderline candidates. Too much time has gone to the preliminary consideration of the dozens of candidates,

who have made merely safeguarding applications, who really intend to go elsewhere if they can. The first need is to secure the prompt exchange of information between universities at agreed dates about acceptance of first and second choices, so that these can be eliminated from the lists of other universities lower on the candidate's lists. Great relief would be afforded to schools and candidates if one set of detailed application papers with the attached reports could be passed on from one university to another down the list of choices as the application was dismissed. Another advantage of a co-ordinated scheme would be that universities could protect themselves more easily against the unscrupulous candidate, who withdraws at the last moment because of an unexpected offer of a vacancy elsewhere. And it is only if conditions exist in which responsible people can consider the doubtful borderline candidates as persons, and be in a position to form intuitive judgments of value about them, that there is any hope that some of those, who, as Professor Pascal points out, have had no chance of showing their potentialities because of lack of the opportunity to awaken them, will reach the universities.

Recently I heard a Dean of a Faculty complain that he and his colleagues had tried interviewing all their three hundred or so applicants for about fifty vacancies. They found that the results were unrewarding and little better than those secured when they had drawn a line across a Higher Certificate mark list. Anyone with experience of interviewing can imagine their difficulties. With the help of a central organization—and dare one say, with a more considered approach to the problem—might they not have achieved something better? The firm applications might well not have exceeded a hundred. Many of these could have been classed as acceptances or failures without much time being spent upon them. The remainder would not have been too many for detailed consideration after extended interviews and, if necessary, further correspondence with the schools.

The burden on the schools

Schools can reasonably ask the universities to impose no unnecessary form filling and correspondence upon them, but much more important is the effect of selection requirements in dictating the character of the work to be done in the schools. And selection requirements must be seen as part of the sum of requirements which

universities demand from those who pass into them. They have to be met by boys and girls coming from widely differing schools and within the framework of a national system of examinations. In some of these schools the university entrants are only a very small minority of the pupils. In addition to having the ability and knowledge to enable them to start upon a course of study at university level there is rightly concern to see that entrants have not specialized prematurely and narrowly, and the desire that they should be familiar with the use of certain tools of further study, have a reading knowledge of one or more foreign languages, and so on.

Schoolmasters can claim that they have been in advance of university teachers in recognizing that the general education of an eighteen-year-old university entrant is not to be equated with the number of subjects which he has studied, that the scientist has not necessarily a better grasp of the humane studies because he has passed "O" level French and Latin, nor the Classical scholar a more intelligent understanding of scientific method because he has continued "O" Mathematics until he was over sixteen. Universities must not seek to simplify their problem of selection by adding to their demands of examinable work to be done in the schools, until no time is left for the schools to develop appropriate studies and interests outside the framework of the examination system, and no time left for their ablest boys and girls to participate fully in the life of the school community, which must be impoverished by the measure of their abstention.

The interdependence of the schools and the universities is closest and most obvious at the point of university selection. Universities anxious for their autonomy and for the quality of their entrants must not forget that, unless the Grammar Schools, which provide the majority of them but which are not merely preparatory schools for the universities, are vigorous and healthy institutions with an effective measure of control over their own affairs, the quality of the entrants must decline.

II

By Lilian E. Charlesworth
Headmistress, Sutton High School

The question of selection for the universities has long tormented the heads of schools and has been forced to the foreground of their consciousness because of the insufficiency of the number of places since the war. The position has improved each year, and now it must be agreed by most people that there are not many pupils whose ability warrants their acceptance at a university who are not in fact able to find places. They are not, however, all accepted by the university of their first choice. It is sometimes right that this should be so, since they may not have either the qualifications or the qualities which that university requires; but sometimes they are forced to make a choice because one university or university college requires a firm acceptance at a date before that at which another institution makes its selection.

It is very hard for those responsible for pupils in school to understand objections to a central registry on the part of the universities. For candidates it would have the great advantage of enabling them to be informed with certainty by a given date of their acceptance or rejection by the university of their first choice. The candidates would then be able to give a firm answer and the disagreeable necessity of demanding a deposit, as is sometimes done, to be forfeited if the place were not taken up, would disappear. It is not always appreciated by those outside the schools that boys and girls, whose whole future may hang on the obtaining of a place at a university, are subjected to a really severe strain during the period of waiting, in addition to the strain of taking a number of examinations for different colleges. This would be very greatly diminished if it were known that a single application only need be made and that this would be passed on from one university to another in order of the candidate's choice. It is true that if such a system were adopted, some candidates who had been accepted would fall out before the academic year began, owing to their failure to obtain an award from the local authority or for other reasons, and that the vacancies would have to be filled by candidates who had been placed much lower on the list; but surely unavoidable withdrawals take place in any case. This is a difficulty

which could be obviated only by delaying all acceptances until the results of the General Certificate were known, as suggested by Mr. Dale. Such a plan would inflict a cruel hardship on the candidates, who would thus be in suspense for ten or eleven months, and it is surely unthinkable for that reason.

Principal Nicholson believes that the device of a central registry would strike at university autonomy, but this view, which is shared by many university authorities, seems to indicate an erroneous conception of the scheme. The universities would, as always, make their own selection from the best of the candidates applying to them; the only difference would be that they would be unable to consider until after a given date those for whom they were not a first choice. It would no doubt be necessary to have a common form of application, but this could hardly be termed an infringement of autonomy, and (if I may venture to mention this here) it would be an enormous relief to overburdened heads of schools if they were required to write testimonials for their candidates in one form only, instead of having to rearrange the same material in five or six different ways for as many universities. But this is of course a minor point.

It is not the province of those in the schools to tell the universities how they should make their selection. Nevertheless, there is a general feeling that all is not well in this respect. Too many undergraduates fail to stay the course, and it is disconcerting to find that some even fail the examinations held at the end of the first year. I cannot feel happy about the remedy proposed by Professor Pascal, namely, that admissions should be on a more generous scale with the understanding that those who prove least competent can be jettisoned at the end of the first year. Students are sometimes sent down at the end of the first year or even in certain universities at the end of the second, and it seems impossible to justify such a waste of time at a period of their lives when they should be preparing for their careers. It would be far better to endeavour so to improve methods of selection that these misfits are very few.

A complaint now not infrequently heard is voiced by Mr. Wolfenden, that too many undergraduates seem unable to make the fullest use of the opportunities offered by university life. This is undoubtedly partly due to the urgent need which nearly all now have, for economic reasons, to succeed in their examinations; there is no time to meander down delicious byways—one must tramp

the hard high road. But it is also due, one fears, to the fact that methods of selection tend to pick out a certain type, ostensibly competent on academic grounds but with other qualities unknown.

It is very hard to see how this can be remedied. Mr. Wolfenden rightly reminds us that as a university exists to provide higher education, selection must largely be based on academic ability. How is that to be ascertained? Some universities hold examinations; others depend on the record of examinations already taken or proposed, and on the school estimate of ability. I believe that ideally each candidate should be interviewed, but numbers, and also expense, make this impracticable in general, and, as Principal Nicholson points out, interviews hurriedly or perfunctorily conducted would be worse than valueless. Professor Pascal believes that suitable intelligence tests might be devised which would be reliable guides to potential academic achievement, but what test could be given for the other qualities desirable in a university student? The school report should, and does, play a very important part in selection of candidates, but standards inevitably vary from school to school and the human element makes it difficult to assess reports.

All heads of schools would strongly support Mr. Wolfenden in deprecating any idea of "booking" candidates more than a year ahead, although there are, regrettably, institutions where this is still done; the objections are patent. They would also agree that no university should accept candidates below a certain standard, even if this were to result in a slight diminution in number. All that has been said on this problem, however, has not brought a complete solution. The situation is complicated at the moment because of the urgent call for economy which may cause some reduction in the number of Major Scholarships given by local authorities; (the variation of standard on which these are awarded by different authorities has frequently been noted).

It is, however, most encouraging that the universities and schools are now working so closely and constantly together on this problem. It is one which, because it deals with human material, can never be finally or perfectly solved, but we may hope by thought and consultation to reach a method of selection which will both do justice to individuals and ensure that in this critical epoch our academic resources are used to the best possible advantage.

SCHOOLS OF EDUCATION IN AMERICAN UNIVERSITIES

By C. H. Dobinson

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In the *Universities Quarterly* of February, 1949, Dr. Max Beloff contributed an article on American universities. In this he rightly deplored the neglect of modern language studies both at school and college level. He then sought to find the reason for the low standards of basic learning in the high schools and the following passage occurs:

> " Scientists assert that fundamental training in basic fields like chemistry is also badly neglected. Here (and probably in other fields) the blame probably lies, at least in part, with the powerful departments of education which have managed to gain far too many converts to the idea that so-called ' teaching methods ' are more important for a would-be teacher than knowledge of the subject he is going to teach."

The present writer finds himself somewhat in disagreement with Dr. Beloff's views quoted in this passage. Like Dr. Beloff, he deplores the neglect of modern languages and the low standard in high school work, but he believes that the causes lie far deeper than in the schools of education. Indeed, he believes that they are fundamental forces of mass psychology against which all forms of education in the U.S.A. are battling, and must continue to battle, if the soul of America is to be saved.

School standards in Great Britain and U.S.A.

It is generally admitted, both in the U.S.A. and in England, that the standard of work of the high school graduate coming up to the American university is at least two years behind that of the English university entrant. The real explanation of this situation was given by Dr. Beloff in an earlier passage of his article. " The Americans," he wrote, " seem to have committed themselves to the view that school is primarily a place for integrating the individual child into the community life, and only to a secondary extent a place for imparting information." Indeed, it would probably be true to say that since about 1850 the main demand made upon the schools by the people of the U.S.A. has been the welding together of the children

of scores of different races, nationalities and creeds into a single nation. In comparison with this the other legitimate aims have been regarded as little more than means to this over-arching purpose.

No one who knows his U.S.A. questions whether the schools have succeeded in this task. There is now an American way of life which holds for all the races in that vast country and which unites them all in pride and patriotism and sense of power—and in generosity and goodwill. Whether it be judged by Coca-Cola, "Juke boxes", women's professional clubs, student fraternities, or whether by attitudes towards church attendance, towards work and towards the profit motive in economic life, there is now a point of view that is distinctly and emphatically American.

This miracle of human integration has been almost entirely the work of the American schools. Whilst so far as destroying racial consciousness is concerned the work is not yet complete, in other respects the success has been too overwhelming, and the machine is over-running its makers—or so it seems to the writer.

Schools in the building of the nation

But, committed to the great task of nation-building, the schools have naturally not concerned themselves with trying to select, at an early stage, the brightest from the mediocre. There has been no desire or reason to push the cleverest children forward with scholarships, or by any other means, on a path of more rapid intellectual progress. Indeed, with such heterogeneity of linguistic background in the schools, it would, until comparatively recently, have been a well-nigh impossible task truly to segregate the high-flying from the pedestrian at the age of 11+. So nothing comparable with the work of our 1902 Education Act, creating a special ladder for the gifted, would have been possible in most parts of the U.S.A. fifty years ago. Nor was it necessary, for from as early as the middle of the nineteenth century the principle of free secondary education had been put into practice in the eastern states. It proved to be a sound investment for the nation, both economically and socially, and accordingly the plan spread westward with extending settlement. The land-grant colleges gradually provided the coping-stone of free university education and the result was a wide and gradual educational stairway in contrast with the English system of the steep and narrow ladder. Under the American conditions there has never been any need for

the English tradition in which brains and indefatigable industry were the only way of obtaining educational compensation for having parents of low economic status. The great variety of forms of work which the undergraduate might perform, not only during his vacation but during the term itself, removed the necessity for scholarship grants, though it correspondingly lowered the standard of intellectual work. Naturally enough the resulting difference between the English and American student is considerable—at least until the stage is reached when the American student is also motivated towards maximum intellectual output.

It is these factors which are the real cause of low standards and not "the powerful departments of education". The principle, accepted throughout the nation, that the main function of the school is assimilation and not differentiation among the pupils has had two important subsidiary doctrines. Firstly, that boys and girls should everywhere be educated together and should all be made to like it. Secondly that, in the interests of homogeneity, differences of intellectual endowment should be ignored as far as reasonably possible. We should recognize that these principles have not been imposed by any one group; they evolved in the nineteenth century as expedients for dealing with an astonishing and unprecedented national growth. Proving successful in dealing with the situation, they have come to be accepted as part of the national way of life. Accordingly they are likely to remain until a new set of circumstances and conditions arises. Perhaps these new conditions are even now in the process of emergence; certainly there are signs that American education is not equal, in the field of culture, to the vast responsibilities which she now carries by reason of her economic dominance. But in the bright American sky these portents have a size less than that of a man's hand and in the U.S.A. there are as yet few who would agree that there is need for modification in the educational structure and tradition. Incidentally, of these few, quite a number are to be found in the university departments of education and there are many among the teachers themselves. But these would-be reformers find themselves opposed by the will of the people, expressed in the force of custom and the overpowering mass-suggestion that American know-how is the best that the world offers. No doubt our own national outlook was very similar fifty years ago, and with less reason; our more tentative attitude today is the result of suffering rather than of virtue.

Teachers and parents

Let us consider the relationship between the teachers and the parents. The latter are completely committed to the view that social adjustment—which includes the practice of boys and girls to make dates and get " dated " in early adolescence—is the primary duty of the school. So the parents would not tolerate, in the public schools, any " streaming " of pupils by abilities such as is common in most English schools. Of course the teachers would like to make their classes less heterogeneous—sometimes they have a range of I.Q. from 80 to 150. Many teachers have told the writer that the great variation of ability in their classes is the source of nearly all their difficulties and often results in their developing a feeling of complete frustration. With young bright children and much older dull ones in the same class they have to aim their lessons at the middle group, almost neglecting the bright and seeking to provide some interest for the dull. But even then the dull fail to be stirred and teachers admit that many a boy and girl at school over the age of 16 would be happier and more useful at work.

It is of course true that in the large schools of great cities the teachers have been able, in the interests both of themselves and their pupils, to establish subject groups at different intellectual levels without arousing parental hostility. Partly this is because the very complication of the arrangements of a large school prevents clear-cut groupings of superior intelligence becoming very apparent. But in the small schools of the U.S.A. such differentiation is much more difficult, and the majority of America's schools are still small ones. These are integrated with the community and subject to public opinion to an extent inconceivable in this country. This is largely because the control and initiative rest almost entirely in the hands of districts, many of which, judged by English standards, are far too small. In these circumstances personal rather than objective considerations often play too large a part and restrict the freedom of the teacher both inside and outside the school. Indeed the teacher (far more often a woman than a man) is expected outside the school to behave according to the strictest nonconformist tenets. In some communities smoking and dancing by the teacher are frowned upon, and in most small towns teetotalism is expected of the teachers of both sexes. As one little booklet, produced with the object of attracting young people into the profession, puts it: " If you are going to teach, don't drink; if you are going to drink, don't teach."

Moreover, it is very seldom that a teacher has economic security comparable with that of a teacher in Europe. "Tenure," *i.e.*, permanent posts, can seldom be obtained before one has taught for five years and often longer. Although salary scales are now very much higher than they were a few years ago and some pension schemes are extremely good, yet a married man with a family cannot take risks of not getting his contract renewed. Looked at in this way, as a worthy but acquiescent servant of the community, the teacher is not in a position to demand, either in work or behaviour, the standards that he or she may desire in the school pupils. Still less, then, in general, is he or she free to group them according to their abilities and to take the most able along in a separate stream.

The teachers, then, have to accept the existing system and to do their best to make it work. And this they do with great devotion and skill.

University schools of education

What part do the university Schools of Education play in all this? Firstly, like the school teachers, they are not free agents; for them also, or for most of them, *Vox populi, vox dei.* As recent events have shown too painfully, neither teachers in American universities, nor the universities themselves, as a whole, have that academic freedom which in most European countries has long been accepted as fundamental for the advancement of knowledge. State universities, in particular, are subject to political pressure and Presidents of universities may be made or unmade at the wish of the State's elected Governor. The School of Education of most universities is not, therefore, in a position to advocate reforms which run counter to accepted patterns of thinking. Any objectives that it holds can only be achieved in the long run, and very partially, through the production of better teachers and the influence of these upon public opinion, present and future. Fortunately the impact of the universities upon the teachers is greater than in any other country save, perhaps, Scotland. For a very large proportion of the teachers, a proportion which increases every year, are graduates, and a smaller, but rapidly growing proportion, have higher degrees in education. The course for a Bachelor's degree lasts four years, compared with the two-year course of an English training college. Whilst as we have said the university entrant in England is two years ahead of the university entrant in the U.S.A., the Training College entrant in this country is in general at least one year behind his university brother

entrant and today is usually, though not always, distinctly less able academically. It is probable, therefore, that the primary school teacher produced by an American university is academically and professionally at least the equal of her English counterpart. In her Freshman and Sophomore years the American undergraduate has pursued academic and professional studies in nearly equal amounts, the academic including English language, social science, general science, mathematics and art. In the third and fourth years the studies are almost entirely professional, with sub-divisions such as " diagnostic and evaluative techniques ", " matter and method in health education " and practice teaching.

The university course for the High School teacher differs from that of the primary or grade school teacher in requiring far more specialization, especially in the third and fourth years, upon the academic subjects in which the future teacher will " major ". For instance, out of 30 semester hours the future teacher of physical sciences must devote in one university at least 8 to physics and 8 to chemistry. Admittedly, this will not bring him to the standard of any English honours degree in science. But there is no special point in his reaching this standard while there is no hope of his teaching the subject in a High School to the standard of Sixth Form work in this country. Until the American nation is able and willing to set less store by social adjustment in the secondary school and to admit the principle of differentiation by levels of intellectual endowment, it will not be possible to achieve the same standard of knowledge and intellectual experience by the age of 18 as we produce in our grammar and public schools. We need to remind ourselves that our sixth form level of attainment applies to only a small proportion of our young people and that the population changes in the U.S.A. are still continuing. For instance, besides the immigration from Europe there is heavy unrestricted immigration from Puerto Rico, a good deal from Mexico and a steady drift of coloured and white from the southern states northward and into California.

Our own problems

Our system unquestionably gives us a great advantage in the fields of higher study—an advantage which we have not used adequately whether in the fields of arts, or in pure sciences, applied sciences and human sciences. Accordingly we have lost a good deal of that leadership in world thought which should have been ours, but which

we may yet regain if the recent expansion of our universities is judiciously maintained.

Meanwhile we have also to maintain the levels of teaching and achievement in our grammar schools and to resist the shortsighted policies urged by those who would have us copy the American comprehensive high school in the pursuit of elusive hundred per cent. social homogeneity. Interests which are based upon intellectual endowment have an unhappy knack of creating stratification even where economic factors have produced uniformity.

We have also to see to it that the teaching in our primary and secondary modern schools continues to improve in quality and effectiveness at the same rate as it is improving in American schools. In this matter the American University Schools of Education are considerably ahead of us at present. Despite the excellent pioneer work already done by some of our newly created University Institutes of Education, we have no pattern of in-service training, improvement and encouragement of teachers comparable with that of the United States. With us research degrees in education are for the ambitious few and refresher courses, whether provided by the Ministry of Education or by Institutes of Education, are occasional and do not provide for continuous professional development. But the American Master's Degree in Education—admittedly at a lower standard than the corresponding degree in England—provides a stimulus for steady advancement in professional competence. For the residential qualification for the degree can be obtained by attendance at three or four university summer courses during the long vacation of the schools. Preparation for the degree is usually begun by teachers after they have had some five or more years of experience and are beginning to feel the need of further thought on their work, or of bringing themselves up to date in their subject teaching. Recently a greater incentive has been the considerable salary increment—seldom less than $300 per annum—by which the degree is recognized. Some States have gone further and have demanded the Master's degree before a teacher can be given a permanent appointment. California has adopted this policy together with one of the highest salary scales in the United States.

It is beyond the scope of this article to discuss all the various subjects such as social studies, curriculum construction, dramatic play, children's literature, child development, music and rhythm, language arts which can be studied as part of the work for the

Master's degree. But, because it is a field which we are only just discovering as important, we should give special mention to "Guidance" and the function of the counsellor in American schools. Preparation for this work is essentially a post-graduate study which again can be taken up by experienced teachers in summer courses. It involves more than vocational guidance, even though this is the main element.

This is, however, only one example of the American principle of keeping the teacher from forming a crust around his ideas. The majority of English men teachers remain teachers for nearly forty years. For financial reasons, for all save a few of them, there is no chance of re-establishing lengthy contact with their training college or university. Certainly it is difficult for the teacher who is playing a full part in the school life to study at night for higher degrees. And for the non-graduate teacher a degree is often above his reach. So, despite the best of intentions he tends to become the typical routinized pedagogue—at least in the classroom.

In keeping teachers interested in their work, in preparing many of them for promotion, whether as counsellors, principals, superintendents, or supervisors, or even for work in teachers' colleges, the university Schools of Education are having a profound effect in America. Their greatest danger is not of becoming too child-centred, nor that of encouraging low standards of academic achievement, but that most of them give no attention to any education other than American. The United States is so large and the variations among the states so interesting that this attitude is completely understandable, but inbreeding is notoriously a false policy in the realm of ideas as well as in the farmyard. It is desirable that more Schools of Education should investigate and consider carefully some of the secondary and higher education of England, France, the Scandinavian countries, Germany—and even of the U.S.S.R., if opportunity arises. This would help to provide yardsticks by which teachers would be better able to judge the success of the existing methods in the schools of the U.S.A. Still more important it would enable Americans to discover that a very homogeneous democracy can exist, as in Norway, Denmark and Sweden, without the agency of a comprehensive high school and that differentiation between pupils at this stage enables a great deal of time to be saved in the lives of young people and permits a considerably higher standard of work for the first degree at a university. It may even be essential for the maintenance of an intellectual aristocracy.

THE HISTORY AND PHILOSOPHY OF SCIENCE

By Douglas McKie

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In his recent book, *The Origins of Modern Science, 1300–1800**, Professor Herbert Butterfield, writing of the so-called " scientific revolution " of the sixteenth and seventeenth centuries, expressed his profound conviction that

> " since that revolution overturned the authority in science not only of the middle ages but of the ancient world—since it ended not only in the eclipse of scholastic philosophy but in the destruction of Aristotelian physics—it outshines everything since the rise of Christianity and reduces the Renaissance and Reformation to the rank of mere episodes, mere internal displacements, within the system of medieval Christendom. Since it changed the character of men's habitual mental operations even in the conduct of the non-material sciences, while transforming the whole diagram of the physical universe and the very texture of human life itself, it looms so large as the real origin both of the modern world and of the modern mentality that our customary periodisation of European history has become an anachronism and an encumbrance. There can hardly be a field in which it is of greater moment to us to see at somewhat closer range the precise operations that underlay a particular historical transition, a particular chapter of intellectual development."

And this " supremely important field for the ordinary purposes of education", Professor Butterfield saw as one that was " manageable " for " students in both the Arts and the Sciences". We shall refer to this point later. But it can be said at once that no historian, other than the very few historians of science, has yet given this much neglected field of study any such recognition or importance as is here emphasized. The general historian usually gives it a few paragraphs, or sentences, and not always very accurate ones.

Hard upon the heels of Professor Butterfield came Dr. W. P. D. Wightman with his *Growth of Scientific Ideas*†, the voice from within

* Bell, 1949.
† Oliver and Boyd, 1950.

the scientific camp itself. Rightly discounting any claim for his book as one more history of science, for it is much more than that, Dr. Wightman described it as

> " a guide to the study of the development of scientific thought as illustrated by a few dominant ideas. An attempt is made to appreciate the problems as they appeared to the leading thinkers of each age, t_ describe in outline the nature of the solutions attempted, and to assess (in the light of later modification) the proportion of essential truth to psychological imagery which is inevitably interwoven therewith in the enunciation of this truth. In this way science becomes revealed as a *struggle*, a struggle no less charged with humanistic value than the struggle for political liberty or national expression ; in a word, as a branch of *Literae Humaniores*."

Dr. Wightman was, however, concerned with a practical educational problem as well, one perhaps only implied by Professor Butterfield ; and he drew attention to the fact that all recent proposals for educational reform have called for greater emphasis on the history of science at every stage in our educational system. He considered, very properly, that this demand would be most effectively met if it were realized that it is prompted by " the growing sense of frustration in the face of the modern dilemma". The crisis of our time, material and spiritual, is largely the result of the extraordinarily rapid development of science and technology (and not in the last hundred years, as may be too readily assumed through the accident of last year's celebration of the centenary of the Great Exhibition of 1851, but well inside the bounds of the last fifty years, for it is here that the scientific pace has quickened and the scientific sowings of three centuries have come suddenly and amazingly to harvest) and the consequent replacement of the traditional classical education by a scientific education. Sometimes, but not always, this scientific education might more correctly be called a training rather than an education, and a training partly divorced from an education by the acceleration of scientific life and progress, whereby we may well be doing ultimately more harm than good to some of the most able students entering the universities. Few would assert that the results of this change, so far as it has gone or, rather, been forced by circumstances, have been altogether happy and satisfactory. There is growing concern among many scientists about its consequences.

On the other hand, the isolation of our future governors and leaders in classical or in non-scientific studies tends to maintain the intellectual gulf already yawning between the governed and those who " rule and govern". The classic and his colleagues in the Faculties of Arts in our universities need, in our time and in face of our problems, to be acquainted with the triumphs and failures of our scientific past, in a word, with the history of science. But the gulf, which is so generally recognized in our present educational system, is widening more dangerously at the moment through the constant forcing of the pace of scientific education, whereby other interests have too often to be crowded out of undergraduate life and studies. The education of the scientist needs to be " liberalized ", and urgently, away from its present narrowness. Our specialized education in science largely trains undergraduates to look at things exclusively from the point of view of current scientific theories and concepts and gives them no equipment to appreciate and consider how these matters appeared to men at other times, even very recent times in some cases, because the speed of scientific advance has now become so rapid. Vocational training, sometimes in unconscious disguise, encroaches perilously upon learning. It is a sobering and a frightening reflexion that university teachers still active may, if this trend is not reversed, be faced before they reach the brink of their academic demise with a generation of undergraduates in science inspired with the faith that what is not in the syllabus is not in Nature. As for the method of prescribing wider studies in his own field to broaden a student's outlook, the remedy merely aggravates the disease. It is in all probability too late, and the pace is now too quick, to hope that a university training in science shall include some subject outside the normal scientific curriculum; but an obvious remedy for the present narrowness in the education of undergraduates in science is to be found in the inclusion of some serious study of the history, and the philosophy (a point to be dealt with later), of science.

In the writing of the history of science, much has happened in the last quarter of a century. It has been written or rather re-written (even distorted) twice within that period with a special purpose, indeed with special political purposes, once to prove the emergence of a " master race " and again, since it is a fertile and largely untilled field and therefore open to such treatment, to " explain " according to the principles of the Marxist historian the dialectical evolution of a classless society.

Sometimes, too, the history of science has been written and even studied for the sake of explaining and illustrating and producing lay appreciation of what is called " scientific method ". The men who in the sixteenth and seventeenth centuries ushered in our age of modern science had no idea of any peculiar " scientific method ", but only that they were studying Nature by the new experimental philosophy. The popular modern belief in the existence of a peculiarly " scientific " method is merely an illusion. There is no such thing as " scientific method ", no process peculiar to scientific thought and practice and discovery. Men of science use only the same logical processes of thought as those employed by the classic, the philologist, the engineer and every other kind of thinker. We hear much of a so called " historical method ". This seems to be the technique practised by historians in the study of documents and in sifting to conclusions the evidence therein provided. (At least, this is all that the writer has been able to discover about it.) If this is different from the ordinary logical processes of thought, and different from the almost mystical " scientific method ", the bushel under which this candle is hid should be lifted for the enlightenment of our darkness without any further selfish delay.

There is no peculiarly scientific method. And there is no bar to the broad understanding by any educated mind of the historical development of science with its advances and its retreats, unless Science, which set out to explain the workings of Nature, is to confess that her course is run and has ended in incomprehensibility. For the undergraduate both in the Faculty of Arts and in the Faculty of Science, no such bar exists. " Here and elsewhere," said Aristotle, " we shall not obtain the best insight into things until we actually see them growing from the beginning."

Neglect of the history and philosophy of science

The history of science, considered as a subject of university study, provides a great field for research, both in itself and with regard to general history. The rise and fall of theories, the growth and development of ideas and of all scientific knowledge, the process of discovery and invention, the applications of science to what has come to be called technology and its influence on human life and on society—the study of these matters is the study of the very mainspring of our contemporary civilization. We need refer only

to Professor Butterfield's pronouncement quoted in our opening paragraph.

But what of the philosophy of science? This is an even more neglected field, in fact almost a no man's land between science and philosophy. The "Foreword" to the first issue of the recently established *British Journal for the Philosophy of Science** points out that, with the increasing *tempo* of scientific training and activity, "the philosophic aspect of science has become obscured; science is no longer primarily a philosophy but an instrument", and adds that "science is in danger of becoming transformed from a vision to a blind automatism, its pursuit from a pilgrimage to a chase". The appreciation of the philosophical significance of science and the meaning of science must be brought before the student, now hurried through his training with inadequate leisure to reflect on the nature and purpose of his work, if only for the reason that he is a member of an expanding group into whose hands the direction and control of our increasingly scientific civilization are passing.

Far too little is being done by the universities as yet with regard to the prosecution of studies in the history and philosophy of science and the remedying of some of the serious defects in our educational system, defects which are so frequently deplored.

Developments in the University of London

However, the University of London has long ago given a lead in the study of the history and philosophy of science, a post-graduate department in this subject having been established in University College in 1924. After the difficulties of its early years and the practical suspension of its activities during the recent war, the department now has a staff of six, including a Professor, a Reader, an Honorary Lecturer and three Lecturers, with help from some teachers in other departments; and there are upwards of sixty students, all post-graduates. The degrees of M.Sc. and Ph.D. are awarded by the University of London; and the D.Sc. is conferred for original published work in the subject. This is the only serious attempt made in the British universities to grapple with a problem that is widely recognized as urgently in need of solution. Students from many Dominion and foreign universities have joined the department in increasing numbers and teachers and lecturers in Training Colleges have provided a notable proportion of the students

* Thomas Nelson and Sons, May, 1950.

enrolled. A prime requisite for such studies is, of course, a library containing a good and representative collection of the older scientific books. The University of Oxford has a Museum of the History of Science and annual courses of lectures on the subject. From time to time courses of lectures have been given in the University of Cambridge. But the University of London, alone among the British universities, has established a department for teaching and research in the subject leading to higher degrees.

Among other activities in this country, we might mention the publication from 1936 onwards of the quarterly journal, *Annals of Science*,* a review of the history of science since the Renaissance, and the more recent foundation of the British Society for the History of Science,† which holds meetings for the reading of original papers, publishes a *Bulletin* and includes a Philosophy of Science Group in association with the Society.

A much wider realization of the urgency of extending the study of this complex subject at all educational stages is necessary. The history of science should become part of the general teaching of history, if the origins of our modern world and our modern way of life are to be understood. The history of technology, a vast field hardly disturbed as yet except by a mere handful of daring investigators, needs wide exploration and development; for here, by its applications, are to be found so many of the results of the impact of science on our social and economic life. The importance of the history of science is undeniable; for scientific discovery and its application provide the motive power behind our modern civilization.

* Taylor and Francis, Red Lion Court, London, E.C.4.
† Hon. Secretary, 10 Exhibition Road, London, S.W.7.

THE PLACE OF THE CLASSICS IN THE MODERN UNIVERSITIES

By Philip Leon

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Any practical proposal to be advanced here will come from a judgment of value—from an estimate of the specific value and need of Greek and Latin literature for our immediate predicament. But to pass any judgment of value without giving at the same time something of the personal equation of the person making it, is to pontificate, and to pontificate impertinently, because in the wrong place, not *ex cathedra*. It is the device commonly adopted by " translated " Bottoms who wish to give the impression that their pronouncements come straight from the horse's mouth. The writer of this article, then, who wishes no such thing, is the product of an old-fashioned English classical education. This means that he drank in, breathed, and lived on, Latin and Greek throughout his boyhood and youth and looked forward to living by means of them for the rest of his life; practically the only geometry he learnt consisted of one axiom—that the world must and would provide an adequate living for one with an adequate knowledge of Latin and Greek. In his eyes there was no such thing as a " classical education ", that is to say, one kind of education amongst other kinds; the only real education there could be was synonymous with expertise in the minutiæ of the Latin and Greek languages. At the same time, however, he developed a double life: alongside of the classical Dr. Jekyll there grew up in him a Mr. Hyde nurtured on modern literature and philosophy with a distinctly romantic slant. And this Mr. Hyde has always rebelled violently against the role—which has been almost *de rigueur* for anyone educated in the classics since at least Alexandrian times—of a partisan for the Ancients in the battle of the Ancients *versus* the Moderns; for he believed, in his romantic heart, that classical antiquity was a phase which the human spirit had definitively and happily left far behind and that classical literature was as little fitting and as cramping for modern man as his swaddling clothes would be for an adult. Yet it is precisely to this role that the writer finds himself driven by the latest developments.

Classical civilization and our own

We are at the point now where we are being compelled to take almost daily stock of our civilization, which we are afraid of losing, either dramatically in one fell cataclysm, or imperceptibly by the slow attrition of circumstances. And in this stocktaking not only are we becoming more and more acutely conscious of the Graeco-Roman origins of our civilization, but we are coming to think of its essence in the same way as did the Greeks and the Romans, and, what is more curious and almost confirms the cyclical theory of history, we are coming to look for the opposite of that civilization from (roughly) the same quarter of the compass. The Greeks, who had more than one word for nearly everything, had none for "civilized" (unless it was "Hellenic" itself); but they had one for its opposite, namely "barbarian", by which they, as did also the Latin poets, meant pre-eminently "Eastern"; and it was through contrast with this that they pointed that which they stood for themselves, their "civilization". The latter they did not consider, as we have generally done ourselves, to consist in art and letters, or in the systematization of speculative and factual curiosity ("philosophy" and "science"), but in that which, in Euripides' play the *Medea*, produced in the fifth century B.C., Jason reckons as the incomparable blessing he has conferred upon Medea by bringing her out of a barbarian (an Eastern) land to Greece: this was "to live under justice and the law". (Even democracy, though generally synonymous with this, was sometimes reckoned as secondary to it, as, for example, in this play). The barbarism, on the other hand, which they had chiefly in mind over against this was not so much savagery (as, e.g., that of the Thracians), but the regimentation and manipulation of vast masses ("civilized" enough, it might be, culturally) by the will and whim of an autocrat, such as those which nearly overwhelmed them from the East. A thousand years later, the same civilization, taken over by Rome and spread by her over the major part of the Western world, is characterized in the same way by the Gaulish poet Rutilius. Working himself up to a climax in his hymn of praise to Rome, "the mother of gods and men", he declares: "By offering the vanquished a share in your law you have urbanized the orb." Our own verb "to civilize", which, etymologically at least, means "to turn into a city or citizen", echoes that summing up of the Graeco-Roman contribution, which was to turn man into a "political" (i.e., a civic or citizenly) animal.

It seems a very modest one. But modesty of claim and limitation of aim are of the very core of the Graeco-Roman tradition. However, modest or not, the achievement is beginning to strike us as important, indeed as vital, now that we see springing up all around us and, what is perhaps even more terrifying, within ourselves, aspirants to the role of prophets, benefactors and leaders of the infantile and plastic or plasticene, but certainly not political, " masses ", following the light from the East and untrammelled by the dead legalism of the West.

The advantages of classical paganism

" The value of the individual " is perhaps a commoner way of denoting the principle of our Western civilization, and that value, it might be thought, is more Christian than Graeco-Roman. This is true as regards the deeper interpretation of that principle, but that deeper interpretation has been found consistent with the most diverse political applications. To be kept to the Graeco-Roman idea of the value of the individual, even if that amounts, as some have held, to no more than " the rights of each member of an exclusive club ", is, as a minimum at any rate, not the least amongst our needs now that such a minimum is becoming a fast vanishing one, to be replaced by rights and values of no *one* but only of abstract masses and systems, of a world-wide but empty club, one which, so to speak, excludes even its own members.

Speaking more generally, if living Christianity was necessary to save dying man in general and the dying Graeco-Roman world in particular, the Graeco-Roman consciousness is necessary to save us from the now reigning ghost of a dead Christianity. This ghost is immanentist mysticism, which, broadly speaking, constitutes the fundamental dividing line between the modern and the classical consciousness. It is a belief which might be (though, of course, it generally is not) formulated as follows. God (the self-incarnating God) is dead, but his flesh lives and is divine, the finite is infinite. Man is God (for has not God become man ?)—infinite in his ability and goodness and self-sufficient (modern " humanism "). The State, the Nation, the country, the Leader, are divine, and their claims upon us are absolute. From all this, classical man was saved by his innumerable gods, who, if they did nothing else for him, served at every point to mark the limits of the finite and the beginning of the transcendent and to remind him that he himself was a finite or

limited creature. (His "humanism", if he can be said to have had any, consisted in believing that man was only man, and it was thus the very opposite of modern "humanism".) In particular he was saved from political mysticism by his city or patron gods, just as he was from Wordsworthian nature mysticism by his nature gods. Whatever else we may think of his god, the latter was at any rate always transcendent, never to be reduced to that in which he was occasionally or permanently immanent, or rather, resident. If even a dryad was not really the same as her tree or the life of that tree, still less was Pallas Athene or Roma the same as Athens or Rome, their rulers, or peoples, or histories; the mystical attitude was proper only towards the person of the god, while anything else had to be treated with the common sense, caution and moderation appropriate to the merely human, a state of mind described in Epicharmus' "Keep sober and remember to be sceptical".

A political literature

At the same time, Greek and Roman literature is not, like most modern literature, the picture of man as a purely private (though not necessarily solitary) individual—a poetic, philosophic, religious, syndyastic, social, economic, but not in any deep sense political, being. It is a political literature, not in the artificial sense in which the literature of the 1930s tried to become political, but because it was written by and for men familiar with problems of government who took it for granted that, for better or for worse, man is a political, just as he is a fighting, an eating, or a sleeping, animal. And this political consciousness is to be found not merely in the orators and the historians, who form an important part of the study of ancient, as they do not of that of modern, literature, but also in poetry, epic, dramatic or lyrical.

In short, the point I want to make here is that what our age needs most crucially is a sane sense of community and of the relation between the individual and society, and that this sense is best supplied by the classics. More generally—for I do not mean to deny the other claims advanced on behalf of a classical education—my argument is that our civilization being the outcome of a two-fold consciousness, Graeco-Roman and Hebraeo-Christian, both these aspects must be kept alive if it is to be preserved. It can be no accident that this civilization has been, and is being, grievously threatened from two countries, Germany and Russia, in which one

of these (the Graeco-Roman) has had least time to establish itself, and that the growing danger of its internal collapse coincides with a protracted neglect of both in our education. But the only way to keep a consciousness alive, in the absence of its living originators, is to study the literature in which it is embodied and by means of which it may be re-quickened.

Undoubtedly the old-fashioned classical education was the best means for preserving the Graeco-Roman consciousness. It was, after all, the direct continuation of the education which had fashioned the minds of the Greeks and Romans themselves. It did for one side of our civilization what the Bible and the Church did for the other. But undoubtedly also it cannot be expected to resume the part in modern life it once played. Economic factors are against that, and though economic factors are certainly not everything, once a process, however originated, has reached economic solidification, so to speak, it is very difficult to reverse. Of course there will be always, or at least for a long time still, classical specialists; the educational-cultural situation in the West at any rate is fortunately still very far from making that impossible. But they cannot do what was done by the old-fashioned classical education. That handed on the Graeco-Roman heritage as part of the general educated consciousness, while *their* function can only be, like the function of Egyptologists or Assyriologists, that of museum curators; and the Graeco-Roman heritage is still too vital a part of our life to be kept in a museum. (It should also be noted that the old classical scholarship, however minute, was, just because it was continuous with a widespread acquaintance, amongst non-scholars, with classical literature, a humane acquisition, that is to say, a sensitiveness to values, and not, as it is tending to become, with the loss of that general background, a mere specialism amongst other specialisms.)

The use of translations

But what is to be done if the majority of those to be educated can no longer afford to devote most of their time at school and at the university to learning Latin and Greek? The remedy lies in the use of translations It is difficult for any product of an old-fashioned classical education to bring himself to utter, or even to listen to, such a blasphemy. If you cannot have classical lore not only with every *iota*, but with every *iota subscript*, intact, he feels inclined to say, it is better not to have it at all. And indeed one needs only to have

used a reputedly good translation from one modern language to another, and only for the thought content, and to have had, at every *crux*, to go back to the original for an explanation of the translation, and one becomes convinced once and for all of the truth of the saying *traduttori traditori*, translators are traitors. At the best a translation is a faithful rendering of the effect of the original upon the translator (and even then it has to be very good). But though this is true of written translations, something more can be got from the translator if you have him there before you in person. He can vary or expand his translation, he can answer questions, he can clear up difficulties either of the original or the translation, he can even give you an *ad hoc* initiation into the language sufficient to enable you to appreciate a particular solution or at least a particular problem. It may be that you still get only as much of the original as you do of the appearance of the sun by looking at the moon, but that is better than getting your view of the sun from a plain photograph, or technicolour film, of the moon, which is the proper analogue of one book translating another.

What can be done at the university is to arrange that non-classical students (I take it that at any rate a small nucleus of classical students will always exist), at least non-classical Arts students, shall take a short course in the classics in translations under a classical teacher using his own, or expounding other people's, renderings. He himself should be first and foremost a classical scholar. But secondly he should have sufficient knowledge of English, French or German literature, or of modern history, philosophy or sociology, to be able to make his contribution relevant to the interests of the particular group of students to whom he is lecturing. The danger of such courses is that in time they come to be given by men they have produced themselves and who are as little in touch with the original sources as their pupils. The " knowledge " propagated, or rather generated, in this way is indeed a dangerous thing beside which ignorance is truly bliss. A glance at the strange picture of Plato's or Aristotle's political thought to be found in many text-books on political science or sociology, based on other such text-books and as far removed in substance from the Greek texts as their authors are in time from Plato or Aristotle, is enough to convince one of this. The worst vice in such cases is one which cannot exactly be put down to " mistranslation ". It comes from viewing antiquity only through the categories or spectacles of later times, which in

turn comes from not living with the language of antiquity. The only way to see the latter with its own eyes is to think in its language, the language of a people being its eyes. Hence the justification for making the study of the classics first and foremost a linguistic discipline, including writing in Latin and Greek. This discipline must be somewhere, if not in the pupils, at any rate in the teacher, if the course suggested is to do any good at all.

If any consider such a course useless in any case, they may perhaps think it more useful in conjunction with something that certainly appears, and by itself perhaps is, far more useless. I mean the one year of Latin to be taken to about the standard of the London Intermediate, which most universities still compel their Arts students to take; that and the two to five years of Latin at schools which are a preparation for it. This is not intended to be replaced, but only to be supplemented, by what is here proposed. And yet no one can be more sceptical about the good it does than one who has dragged students year after year through it. It has been said that what Eton and Harrow succeed in doing for their pupils is to turn them out, not so much with a knowledge of Latin and Greek, as with a healthy conviction that these languages exist. For his part he often doubts whether he and the schoolteachers from whom he has taken over can claim to have imparted to their victims even so much as an inkling that one of those languages existed once. Sometimes the only consolation he can find is the thought that the discipline may have done them some spiritual good, something that may tell perhaps in another life. And yet his own experience assures him that what may be picked up by a few weeks even of the most cursory study, say of Russian or Turkish, is, if not indeed knowledge of those languages, at any rate something very important—a light which illumines, or a soil which fosters, as nothing else can, any knowledge one may acquire of these peoples either through reading translations of their literatures or in some other way. This leads him to hope that the grind to which his students have to submit under him may produce some worldly good too—that it may help to make real a knowledge of ancient life and literature to be acquired through translations in the kind of course mentioned here. In such knowledge these students are at present sadly lacking, nor, if left to themselves, can they be trusted to set about acquiring it. Hence, if their linguistic gymnastics gives them anything, it is a light which has nothing to light up, a soil which has no seed to fall upon it.

This may indeed be a case in which two things, either of which is useless in itself—the learning of a language without ever attaining sufficient proficiency in it to be able to read anything worth while in it and the reading of worthwhile things but not in the language in which they were written—may together form something of solid use.

But the use, be it understood, is for the study, also for the teaching, of other subjects than the classics. It attaches to an education which is only a derivative from a classical education and can only exist so long as the full and genuine thing exists beside the derivative. But a fatal corruption sets in once an attempt is made to replace the source by the derivative, whereupon the latter soon loses what value it possessed. This driving out of good by bad currency happens when the derivative course begins to be relied upon, not for helping to produce teachers of other subjects, but for turning out teachers of Latin itself. It is in full swing in many, if not most, schools, where people are called upon to teach Latin who have had themselves far less than the combination here considered desirable and little more than the aforementioned grind. The result is that the university teacher who has to bring up their pupils to Intermediate standard wishes that he might at least start them from scratch, in which case he dreams that, though with less time at his disposal, he might come nearer to emulating the achievement of Eton and Harrow. It is most important for everyone, and not least of all for headmasters, to realize that, if any good is to come even from a smattering of Latin, the subject must be taught *at all stages* by specialists. The limitation of the knowledge communicated should be determined by the capacity of the pupil or of the curriculum, never by that of the teacher.

The teacher of classics can suggest programmes or methods. But the safeguarding of the classical heritage for the general culture, and not just for the dwindling circle of classical students proper, no longer rests with him. (Just so, some hold, the re-quickening of Christianity depends no longer upon the efforts of the clergy but upon those of the laity.) It rests with the teachers of other disciplines, English, modern languages, history, philosophy; that is to say, it depends upon their conviction that such safeguarding is essential for the contemporary civilization of which their subjects are, or should be, nurseries or constituents. Hence the general considerations which make up the main body of this article. They are meant to awaken or confirm such a conviction in teachers of these subjects.

REVIEWS

UNIVERSITIES AND INDUSTRY. EDUCATION FOR MANAGEMENT (*Anglo-American Council on Productivity*, 2*s*. 6*d*., 4*s*. 6*d*.)

The two " productivity " reports on educational topics just published are of particular interest in view of the public discussion of the problems of technological education which has been conducted for some months past in the columns of *The Times* and elsewhere. There can be little dispute about the facts which the reports present. In broad outline they are familiar enough, though the detailed statistical information collected by the two teams is of real value, and cannot easily be obtained elsewhere.

Perhaps the most striking fact in the Report on *Universities and Industry* relates to the numbers of top-level scientists and technologists (Honours Degree and Post-Graduate) being trained in the United States and in Great Britain respectively. In Engineering, for example, the annual output of such highly-trained men in America is not quite twice as large as our own. The ratio of populations is about three to one, which suggests that on a *per capita* basis this country has a considerable advantage in this respect. The report concludes: " Since there appears to be a general impression in Great Britain that America is producing a much greater proportion of men trained to the higher levels in science and technology, it should be emphasized that, when account is taken of the different standards in the two countries, the British position is not at present, as the popular view would suggest, unfavourable." It is at the " bread-and-butter " level—the level of the man, who, in this country, would be just capable of obtaining a pass degree, or by part-time study a Higher National Certificate, that America has an enormous advantage both numerically and also perhaps because the American graduate has a better background of general education, and has taken a certain number of the " liberal arts " courses which are so characteristic a feature of the American educational scene. The enormous success of American production, in so far as it can be attributed to educational factors, seems to be based on large numbers of men with only very moderate technical qualifications, but with perhaps a greater appreciation of the many non-technical factors which govern industrial production.

Of particular interest, also, are the views of the university team

on that glittering Mecca of the American engineering student, the Massachusetts Institute of Technology. After pointing out that M.I.T. is not only a technical university but in addition a Government Research Establishment corresponding roughly to the establishments of the D.S.I.R. they concluded: "So far as the teaching activities and accompanying independent research are concerned, we feel that M.I.T. bears a much closer resemblance to the engineering and science departments of our British universities than popular opinion in this country would suggest."

The very real difference in educational climate between the two countries is much more apparent when we turn to the report of the team on *Education for Management*. In this field we find many great institutions—including one, the Harvard Graduate School of Business Administration, whose reputation in the United States is almost, if not quite, equal to that of M.I.T.—which have practically no equivalents at all in this country. Many American universities have large departments (variously named but referred to in the report as "Administrative Studies") which together award more degrees than in any other single subject and which provide an even larger share of graduates to industry than does engineering. For such departments we can seek in vain in the calendars of the British universities.* Of course, it is not implied that some of the subjects in which students of "business administration" receive instruction —such subjects as economics, law, and industrial relations—are not also taught, and taught perhaps in many cases at a much higher level, in this country. But the aim of such teaching is substantially different; in America a part of the work at every stage, and almost the whole of it at the final stages, is planned to give the student early experience of the actual problems of business administration, the atmosphere is "clinical" (to employ a word borrowed by the team from another faculty) and industry itself is regarded almost in the light of a laboratory. It is plain that to treat economics, or law, as an academic subject—employing that word by no means in its pejorative sense—as is done in this country, will produce in all probability a better scholar, but certainly a man with a profoundly different approach to the problems and necessities of commercial practice.

* The University of Cambridge has its "Department of Estate Management" which, in its very limited sphere—the management of real estate and agricultural property—performs exactly the same function as an American business school.

It is, of course, true that there are many colleges in Great Britain which give training in particular aspects of business administration —Accountancy, for example. But few of them claim to offer the broad general training which is required by the top-flight executive, and still fewer find it possible to approach their task in the atmosphere of experiment, even of research, which is so marked a feature of the best American business colleges.

Yet these profound differences are of comparatively recent origin. The first American business college (the Wharton School at Philadelphia) was founded in 1881, and the Harvard Business School is forty-four years old. As recently as 1936 the late Mr. Edward R. Stettinius referred to " the catch-as-catch-can methods that business all too frequently employs to find its future executives ", and in 1943 the (American) National Industrial Conference Board found that " there were not enough such programmes (for the systematic training of business executives) to form the basis for a report ". By 1948, however, there were over one hundred companies, many of them very large, which had recognized a need for special training for business administrators and were in many cases collaborating with universities or other educational establishments in making arrangements for suitable courses, both for men of undergraduate age, and also for those with considerable previous experience in industry.

The report is understandably very cautious in its approach to the question of how far these developments are to be encouraged in Great Britain. The concept of the professional manager, qualified as a manager and not by a detailed knowledge of the particular matter to be managed, has not invariably commanded popular approval in British industry. Universities in this country would perhaps view with misgivings the appointment to their faculty of a Professor of Accountancy or of Marketing, but it may well be that a time will come when we shall have to examine very closely whether our objections to these subjects are based on solid academic grounds, or are in part at least survivals from the time when there was something socially discreditable about " trade " as an occupation.

If it is in fact desirable to introduce into British universities some analogue to the American schools of business administration, the first step in this direction is fairly plain. The best American institutions are almost all postgraduate and their entrants are mostly arts

graduates. For many years there has been anxiety in this country as to the means by which arts graduates can best be introduced into industry, and as to the post-graduate training, if any, which they will find most useful. It is now widely accepted that a man capable of reaching the top levels on the scientific or technical side in industry is well advised, at least in some subjects, to obtain a little research experience before leaving the university, and "refresher" scientific and technological courses for people returning to the university after some time in industry are being organized on an increasing scale. It may be that there is a place in the universities of Great Britain for post-graduate schools of Administrative Studies, which would provide for the managerial side in industry and commerce facilities comparable with those which are already available on the scientific and technical side.

It must be admitted by the most sincere admirer of the American system, however, that there is a risk that it would not survive transplantation to Great Britain. How much is the success of the business schools based on the fact that they satisfy a real need in the modern industrial system, and how much on the immense prestige of business as a career in the United States, which enables them to attract as students men of such ability that their success in business is assured in any case? How far does British industry feel a need for specially trained executives? These are the questions which the Productivity Council's report does not attempt to answer, perhaps because they fall somewhat outside the terms of its inquiry; but they are none the less important questions and the Council has done a useful piece of work in bringing them to the attention of the British public and in particular of the British universities.

D. G. CHRISTOPHERSON.

THE CHANGING CULTURE OF A FACTORY. *By* ELLIOTT JAQUES. (*Tavistock Publications*, 28*s*.)

This is a fascinating and unusual book. It is an account of a research project carried out by the Tavistock Institute with the Glacier Metal Company. The project is still going on; this is a most interesting interim report.

The Glacier Metal Company had already made some remarkable experiments in democratic management of their factories, but the managing director was dissatisfied in various ways with the

organization and practice of democratic management and asked the Tavistock Institute to give them the help of a research team of consultants who would advise them about the details of their organization. The team of consultants from the Tavistock Institute took the line that they would have nothing to do with it unless their help was requested by all parties concerned—not only the directors, but the Works Committee and the trade unions—the research team being determined to preserve their independence. What happened was a considerable change in the structure and organization of the company and considerable discussion as to what forms of detailed organization at various levels would preserve the efficiency and flexibility of the organization.

It had been assumed (and it is still far too often assumed) that what matters in the democratic management of a factory is goodwill. What this study brings out, is that goodwill is not nearly enough. The democratic organization of a factory which is continually involving both social and technical questions needs study and needs learning. The fundamental principle behind all their discussions was that democracy means effective discussion—discussion which both solves problems and gets things done, and gives everybody an opportunity to contribute in their own capacity to discussions of policy. We don't always realize how much effective democratic government depends upon explicit procedure, whether it be parliamentary or local government procedure. If that is so, it would follow that effective factory democracy would have to work out its own methods of procedure, its own rules and principles of organization. This book is an account of such planning and working out of all kinds of questions which effective democratic management of a factory implies.

Of the success and interest of the experiment there can be no doubt. What reading this book makes one ask is how far this can be generalized. The difficulties to be overcome include widespread misconceptions of the necessary antagonism between employers and employed: difficulties of the relations between the single firm working out a democratic system and the trade unions, and so on. The only criticism I would make is that I think the team were so much—rightly—taken up with what may really be called the psychological questions; and I don't think they bring out sufficiently the fundamental distinction between the present government of industry and the kind of government the company was aiming at.

Our present pattern places responsibility for initiative and technical change, etc., on what is called " management ", and quite another kind of responsibility on representatives of the trade unions and shop stewards; their function is important, but it is an entirely negative function. Their relations to management are confined to calling attention to the things that are not to be done; and this curious form of government in itself must produce an antagonism between employers and employed, and only with extreme difficulty can it be changed to a democratic government in which all concerned feel responsibility for the work of the whole. I think the change from one system to the other, which the Glacier Metal Company are really trying to bring about, is much more revolutionary politically than the research team seems to realize. I very much hope that as the experiment proceeds they will consider these wider questions. Their conclusions on them should be of very great interest and value.

LINDSAY OF BIRKER.

THE ESTATE OF MAN. By Michael Roberts. (*Faber and Faber*, 15*s*.)

It is a great loss to all of us that Michael Roberts was unable to complete his project of " appreciating ", as the military say, the estate of man today so far as present knowledge discloses it to us. Roberts was of course a child of his age; he asked the questions which we all want answered and which in our contemplative moments we ineffectively ask ourselves. Yet his friends and critics have joined in saluting in him a freshness of approach which comes near to genius. He was devoted to bringing into the account every scrap of knowledge which science in its rapid advances could supply, and yet he kept forever open and alert a philosopher's eye on the first and last questions of the human mind, which do not change.

In human affairs, as Mr. Churchill so often reminded us amid the contingencies of war, plans have to be laid and decisions taken on a basis of much ignorance. Yet we cannot but feel that ours is pre-eminently an age of advancing knowledge, and that this increased knowledge ought to mean increased power—power to increase human happiness and reduce or even abolish much human misery. In practice, however, it seems to many of us that the same march of discovery which gives to us a wealth of practical techniques also only clarifies our view of the width and depth of the tasks before us,

and even raises anew the doubt whether it is not a mere illusion to think that we can ever cope with them. The same statistical skills which may enable us to increase the fertility of the soil give us a clearer picture than we had before of how very starving the starving peoples of the world are and how very many tens of millions of them there are. Other studies by the same methods of science serve to convince us how difficult it is, and at best how slow it is, to do anything effective about these peoples at all, or indeed with humanity anywhere.

This age of knowledge is by no means, like the eighteenth century with its scientific "justification of Christian optimism", an age of reason. Yet I suppose more energy is being poured in our day than ever before into the attempt not to waste knowledge, but to turn it to human welfare. It could almost be said that in this fundamental matter our generation thrives on doubts and discouragements. And doubts and discouragements there certainly are. Michael Roberts puts very clearly to us many of the mistakes of the past, not all of them due to recklessness or wickedness; but he does not make the mistake of thinking that to see past errors is necessarily to have one's grasp on the golden key to the future. Only the fool can say that history is a record of mistakes and that he now has all the answers. Roberts did not finish his book, though as many have said the main lines of his thought are more than foreshadowed. But to set down his conclusions well and truly, without glamour or easy dialectic, without optimism or pessimism—to write his last chapter, in fact—could still have cost him agony of mind. His thoughts, and the balance of his judgment, would not have stood still. That is clear from every line of the chapters which we have. The struggle of decisive thinking is now left by his death to the reader.

His completed studies—edited and annotated perfectly by Janet Roberts—discuss the world's need for food, the fertility of the earth, the world's forests and sources of physical energy. In the universities many of us turn first and longest to his discussions of the intellectual and nervous power of the world's human beings. He tries to assess, as so many people are trying to do, how much human brain-power the world has at its disposal in trying to apply scientific discoveries to the advancement of happiness. He has at least one strong opinion of his own. Prosperity depends, he argues, not upon the average I.Q. of a population but upon "the proportion of A and A + brains available". He thinks that such slender evidence as there is

tends to show that the figure is something like 10 per cent. for the countries of Western Europe. And this means very short supply for all the tasks of the modern community.

Most readers will have their own strong points of difference with this chapter; but most will agree that all their differences cannot add up into a significant difference on the main issue. If our generation is to go forward with credit in the march of human welfare upon earth, we cannot afford to waste brains.

C. R. MORRIS.

ENGLISH STUDIES TODAY. *Edited by* C. L. WRENN and G. BULLOUGH. (Oxford University Press, 21*s*.)

Most conferences find their best justification in the intangible benefits that escape the closest mesh of procedure, resolution and printed summary; but, while recognizing this, the editors of these papers, which were read at the International Conference of University Professors of English held at Oxford in August, 1950, hope that they " will give some idea of present trends in English studies throughout the world " and that " some of them will have permanent value ". These hopes are, I think, in part realized, but the total effect is nevertheless slightly depressing, not through any lack of quality in the individual contributions, or lack of skill in their arrangement, but through the impression left of university departments dreeing their weirds in monadic isolation, rather like lighthouses—each with its exclusive flash—along some storm-battered sea-coast. The book has four parts—General, Linguistic, Particular Literary Topics, The Teaching of English in Universities—but, even in the first and last sections, too often the axes being ground seem to suggest that aims are unshared, or shared only at the level of polite generalities. Will more conferences, one wonders, be enough to remedy this?

How are nineteen almost unrelated papers to be reviewed in a few hundred words? Few of the papers are " narrowly technical ", we are told to our comfort, but students of literature at least will find two of the three linguistic papers severe reading. Professor Sommerfelt's paper is surely for a very few specialists, and Professor D'Ardenne's " The Editing of Middle English Texts ", although the form is sprightly, has a somewhat grisly professionalism. The honourable exception in the linguistic section is " The New Survey

of Dialectal English " by Professors Orton and Dieth. This is a sound piece of exposition of aim and method addressed in straightforward language to the non-specialist.

Among the particular literary topics priority must be given to "An Approach to Wordsworth's Genius ", and not only because it contains " An Address to Silence ", a new poem by Wordsworth. Miss Darbishire, the author of the paper, describes the poem as " no great shakes " as an addition to the Wordsworth canon, but many admirers of the poet would be willing to sacrifice half-a-dozen late pieces for another new one of 1796 as good as this. But the whole article is an admirable vehicle for the writer's discriminating enthusiasm. Again, Professor Praz writes interestingly in " The Critical Importance of the Revived Interest in Seventeenth-Century Metaphysical Poetry ", reminding us that recent changes of emphasis in seventeenth-century studies have not disposed of Mr. Eliot's famous positions; and that when the smoke of battle has rolled away—since wit and irony are so largely inevitable in poetry today, and sublimity as unlikely as ever—an interest in John Donne is still more " natural " than one in John Milton. It will not do to call undergraduates perverse or Professor Praz a trifle old-fashioned. Probably Donne is still to be described as a contemporary in a special sense not intended by the claim that all good poets are our contemporaries.

Other literary articles deal with the the medieval poet and his public, Chaucer, Lydgate, Elizabethan drama and psychology, and " Romanticism and the History of Ideas ". If we are to expect a picture of " present trends in English studies ", medieval matters are perhaps over-represented and certain omissions are surprising: for example, the lack of any reflection of the present interest in the novel as an art-form and of any consideration of the great English novelists; the lack, too, of any contribution about Pope or any other eighteenth-century poet. The part played by bibliography in English studies today is also left undiscussed. Much of this can be put down, of course, to the practical difficulties of obtaining a truly representative conference, but the neglect of the Victorian period and, more generally, of lesser prose-writers may indicate a real " trend " and a real indifference. An indifference to be regretted.

Many of the articles in the remaining sections contain good things —Professors Ellis-Fermor, Fluchère and James ought not to be dismissed in a single parenthesis—but one must reserve space to

comment on Professor Dobrée's " What is ' Literature ' for ? " It is not so much a matter of agreement with everything he says—one might quarrel with his quarrel about " Language ", for instance—but his whole tone is right and heart-warming. Professor Dobrée knows why we study literature and he wants this " why " to govern our methods of doing so—as it can hardly be claimed that it does at present. His impatience gives his language a personal urgency rare enough in such discussions at conferences or anywhere else. This paper should be reprinted as a pamphlet and circulated as widely as possible. KENNETH ALLOTT.

SOCIAL WORK IN BRITAIN. A Supplementary Report on the Employment and Training of Social Workers. *By* EILEEN L. YOUNGHUSBAND. (*Carnegie United Kingdom Trust.*)

The original report was written in 1945 and 1946 and published in 1947, and yet in 1951—less than five years later—a full length supplement has been issued. " There have been so many changes and developments since 1945 ", says the author, " that an enquiry which started out to form a modest supplement to a report has ended by becoming larger than the original." The new report gives evidence of the detail of those changes and developments; examines them and discusses their implications; describes the different fields of social work; the present manning of the service, pay, conditions and training. All this is soberly set out and backed by Tables in the text and by Appendices giving the content of training courses and examples of staffing organization and of advertisements for posts. But the length—it runs into 256 quarto pages—and official appearance of the Report (its format is reminiscent of the dullest of government publications) cannot conceal the fact that it is describing a social revolution. From behind the carefully assembled detail this staggering fact emerges and hits you like a blow. True, when you have recovered your balance you mutter that you knew it all along and that there is nothing fresh about it. It is admitted that Britain has become a " welfare state "; but this did not happen overnight, nor by means of any very fundamental changes. Certain work, previously done by voluntary bodies and local authorities is now done by the State in much the same way as mines, railways and road transport are now state controlled, and the difference has not in either case been very

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revolutionary. Has more happened to, for example, the hospital service than happened to transport when the British lion was painted on the engines and lorries?

What is the truth of judgments of this kind? It is true that the "welfare state" is in a sense the fulfilment—though still an incomplete one—of a long series of social reforms, but none the less it has taken a social revolution to achieve it; and revolutions, even bloodless and silent ones, aren't easy things for society to undergo, and this particular one has not been easy to recognize or to understand. People notice that certain things, which they like or dislike, have happened, but they still tend to think of them as isolated phenomena and not to realize their implications. The health of the nation has improved, children are better fed and clothed, more money is spent on amusements, on gambling, drinking and smoking—these are facts which are not disputed, yet it takes an enquiry like Rowntree and Laver's *Poverty and the Welfare State* to point the moral that the fundamental change with which all these separate phenomena and many others are connected is that "primary" poverty has almost ceased to exist in this country. In 1936 30 per cent. of the working class population of York were below Rowntree's poverty line—today the figure is 3 per cent. (*Poverty and the Welfare State*, pp. 30 and 31.) These are spectacular figures and it is well that they should be shown in a spectacular way. Like the facts in the Younghusband Report, they do not really tell us anything we did not already suspect; they do not tell us anything we want to deny, but they put in the limelight as fact what had previously been surmise, and the implications of which people had been slow to realize.

Revolutions are not made by Act of Parliament, and though legislation sets the seal on reforms these do not come about unless they are desired and striven for, and furthermore they do not amount to much unless there is the will and the power to make them work in practice. The social progress that has been achieved has been in large measure due to the pioneers in the voluntary bodies, and its maintenance will depend on the quality and the efforts of the men and women whose job it is to make the social services work. Social services can be laid down by statute but they can only be a living force in the community if they are properly manned. It has always been recognized that hospitals cannot be run without doctors and nurses nor schools without teachers, and it is at last penetrating

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the public mind that social services cannot be run without social workers. What has happened is described by Miss Younghusband in words that for all their simplicity cannot conceal the momentous nature of the change: " it is not easy to analyse the causes which have led to social work becoming a profession—for that is the essential change that has taken place " (p. 2). The acceptance of the " welfare state " has brought with it a recognition of social work as one of its essential professions.

There is not yet, however, any clear understanding of what social work is, nor therefore of what kinds of people ought to do it, nor what skills they should be taught if they are to do it well. The education and professional training of doctors and teachers is entrusted to schools of medicine, to universities and to training colleges, which are of a recognized pattern, and a student who has passed the necessary tests will emerge as a qualified doctor or teacher. No doctors practice medicine without training, and teachers must reach a standard marked by degree or diploma. For social work on the other hand there is no uniform qualification regarded as a necessary equipment for entering the profession. It is true that the possession of a degree or diploma in social studies is coming to be regarded as the badge of a qualified social worker and that specialized training in addition to this qualification is required for many posts, yet many who are holding key positions, and the majority of the rank and file, are without either. A small number are graduates in some other subject, some have taken short courses or undergone " intraining " but many simply rely on experience and mother wit. The number of workers with a social science qualification is increasing steadily, but there is not the remotest possibility of its increasing sufficiently to fill all social service posts.

This situation has not been grasped even by social workers themselves. It is still far too common to look at one particular branch—for example, almoning or the prison service—and say, " here is a grave shortage of social workers which is imperilling this particular service " and to argue, without looking where the hoped-for recruits are to be found, that inducements must be offered to make good the deficiency. Unless the overall numbers of social workers are increased, better staffing of almoner, prison or any other service can only denude still further other branches of the profession. It is unrealistic to plan on the assumption that

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the number of trained workers can be indefinitely increased even supposing the universities were able to provide facilities for the desired number. The need for social workers must be related to the needs of the other professions and occupations in the claims on man and woman power. There are only a certain number of people suited by temperament and intellectual capacity to be social workers and they are, by and large, the same people who are suited for medicine, teaching and other callings. The same thing is true of social work as of nursing, and the words of the Minority Report of the Working Party on the Recruitment and Training of Nurses, 1948, are as applicable to recruitment for the one job as for the other. " A nurse recruitment policy . . . . cannot properly be carried out in isolation of a recruitment policy for other occupations. A general policy grounded in an assessment of the need for woman-power in industry, schools, the social services and elsewhere must be worked out first. . . . Reserves of ability at the professional level are limited, and it would clearly not be in the public interest to meet the ' need ' for able people in one profession without regard to the needs of other professions." (Quoted, Younghusband, p. 29.)

Social work has not in the past had its share of high quality professional workers, though it has had and still has a substantial share of the best brain and character of the country through the voluntary personal service of people earning their livings in other ways, as a consideration of the achievements of philanthropy will show. Service of this kind is still forthcoming but it is not enough —nor has it ever been—adequately to man the social services of a complicated industrial community. What then is the answer? Social work is in a position now, by reason of salaries and conditions which compare favourably with other professions, to claim a fair proportion of the limited number of people capable of doing well work of that kind. The number on which to draw may increase with improving standards of health and education but in no foreseeable future will the total need be met. The vital problem is how to use the man and woman power which is available to the best advantage and how to choose and to prepare its new recruits.

As Miss Younghusband says: " Our present discontents would be the more readily resolved if social work could be staffed with paragons. But as they are rare, one of the fundamental problems in both the employment and training of social workers is how to fashion from common human clay a set of people who will be able

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to do what is required of them—and who will not have required of them tasks hopelessly beyond their capacities to perform." When a service becomes universal it must largely be staffed by ordinary people not paragons, and its satisfactory working will depend on the proper use being made of its most skilled and leading members. How to do this is a question that needs most careful thought and should be considered as a single problem and not as a number of separate problems to be solved within the separate branches of social work. Certain kinds of work, particularly those which involve the mentally ill, require a high proportion of the proper type of trained personnel—other functions such as home help for the sick and aged can well be performed by a rank and file of untrained people under a few trained supervisors.

Much more use could be made, also, of part-time workers. The shortage of trained personnel is most acute in professions such as this which are largely staffed by women because of the " wastage " through marriage, but this very fact is a help in recruiting part-time workers. Many married women, trained and experienced social workers, are ready and anxious to return to their old professions after their children's early years if hours of work can be made compatible with home duties. These people are a great strength, for what they have learnt from their own family life will help them to understand and help with other people's difficulties.

More use, again, could be made of voluntary workers, both trained and untrained. In a democratic community like ours where so many activities in the educational, welfare and recreational fields are in the hands of voluntary bodies there is a positive advantage in using voluntary workers also not only on committees but in day to day social work—in Citizens Advice Bureaux, old peoples' visiting, marriage guidance and many other ways. The proper use of volunteers strengthens the social services and saves the work of the professionals—a weekly visit to a lonely old person in his home may prevent his going to hospital and calling on the professional time of doctor, nurse and almoner.

But the main burden of making the social services of our welfare state work must rest on the trained professional social workers who will have not only to do their own job but to organize and supervise their less skilled colleagues. What kind of training are these people getting and how far is it fitting them for their work? This brings us back to the question as to what their function is, for to that their

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training must surely be related. Mrs. Alva Myrdal, lately Principal Director of the Department of Social Affairs of the U.N., in a paper read at the Fifth International Conference of Social Work (1950) distinguishes the following trends in the development of social work in the welfare state—in large scale planning, in democratic social groups, as well as social therapy for those who are ill-adjusted to themselves, their neighbours or their environment, and to these Miss Younghusband adds (p. 107) the world of work (industrial welfare and vocational guidance) and social research. If these are the functions of the social worker there is indeed a challenge to those institutions which train for social work. How far they meet the challenge is described in detail in the second part of the Report. The great development in the acknowledged sphere of social work is in danger of concealing the fact that for all its different aspects it is a single whole. For social workers are all seeking in their different directions to contribute something to the life of the individual in his relation to society. Citizens are " clients " of social workers when they are ill and use the almoning service, or pay rents to a housing manager or use infant welfare clinics or the home helps service, as well as when they are at odds with society through misfortune or delinquency. No student surely can receive a training wide enough to cover all aspects of social work, yet training confined to a special skill may make him unaware of the general problems. In a profession where personal qualities are so vital, education of the person is more important than the teaching of skills, and a good general education can do more to strengthen the qualities of personality which social work demands than a specialized training. Training for particular branches there must be, but that alone will never make men and women into good social workers unless they have either been born with or acquired through education the right temperament and attitude to life, and unless they have learnt about the society in which they and their prospective " clients " have to live.

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NATIONAL CONFERENCE OF CANADIAN UNIVERSITIES. Report of the 27th Meeting held at McGill University 30th May–1st June, 1951.

Canada is the only country of the British Commonwealth that does not at present make any contributions, other than allowances for veterans and certain *ad hoc* grants, towards the cost of higher education. It is apparent, however, that, in the future, universities will be driven to resort more and more to the national treasury for aid. President Nicholson of St. Francis Xavier University in his impressive presidential address drew the attention of the Conference to this subject. If, he pointed out, universities were to receive more assistance from the State, they should make the average citizen feel that they existed to help the ordinary citizen solve his problems. He believed that nothing could serve to ward off the danger to democratic institutions in Canada so much as an alliance between universities, free from all government interference, on the one hand, and the Canadian people on the other. The Conference took a grave view of Canada's position in the present world and members were not allowed to forget the important role which the universities should play at this critical time. Thus, in its report the Military Studies Committee states: " The most important matter of report by the Committee is to urge upon the Conference that we are now in a state of continuing hazard as a nation." Major-General Macklin further elaborated this theme in his address upon the responsibility of the universities to the fighting services. He reminded the Conference that war was raging in different parts of the Far East, that Canadian men were in action, and he went on to say that one of the most unattractive tasks which he had to perform each week was that of writing letters of condolence to bereaved parents. The universities must make their young men aware of the danger in which they now stand and they must stimulate them to train themselves in order to avoid it. In the future the armed forces of Canada would continue to look to the universities for a significant proportion of their output.

Compared with the leisurely deliberations of the British Home Universities Conference the Canadian body contrived in a short space of time to achieve a formidable amount of work. There were reports on Taxation, Text Books, Engineering Education, Scholarships and Fellowships, Films and several other subjects. The delegation to the International Universities' Conference at Nice in

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its report speaks of the waste of time, energy and money spent on "profitless conferences" whose *raison d'être* appeared to be the provision of audiences for "Latin American orators", or for "international pressure" groups with special interests to promote.

Perhaps the most lively discussion took place in the symposium on "The Proper Place of Extra-Curricular Activities in the Students' Programme". The practice of making financial awards to students who take a leading part in student life appears to us to be a curious and, on the whole, undesirable one. In time it may give rise to the belief that there is no need to be a good university citizen unless one is paid. Again, a "date bureau" for freshers is a startling conception to us, but we find it hard to believe that young Canadians are so unenterprising as to feel its necessity. Some of those present felt that there was a tendency to excessive regimentation and organization, and after reading this report we must confess that we share this view. Instead of trusting to mechanism, some representatives believed that a great deal could be done if the academic staff in the different universities took a more personal interest in individual students, and we agree with the view that the professor who regards the student as a nuisance should transfer himself to some more specialized institution. Student government could be a valuable experience in so far as it helped to develop a sense of responsibility, but was wholly bad when it gave rise to the belief that the staff and the students belong to opposed groups instead of being members of the same body. There is, in fact, much in this document to interest the British reader concerned with university affairs.

C. M. MACINNES.

THE UNIVERSITY TEACHING OF INTERNATIONAL RELATIONS. *Edited by* GEOFFREY L. GOODWIN. (*Blackwell*, 8*s*. 6*d*.)

The international meeting of persons specially interested in the university teaching of International Relations, held under the auspices of the International Studies Conference at Windsor in March, 1950, had as its purpose the discussion of "the more important points of view on the desirability, or otherwise, of making more general provision for the inclusion of International Relations, as an independent discipline, in the curriculum of university students." This brochure is a report of that meeting, covering the main problems of the teaching of International Relations in universities today, together with an account of the actual provision

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The case for the study of International Relations as an independent discipline, with a subject matter of its own (" not merely . . . made up of a little law, economics, political geography, etc.") is presented, and objections are thoroughly, even painstakingly, listed and answered. That the subject has still to win recognition in most universities in Europe and the U.K. may account for the formidable number of doubts and difficulties, and the various solutions for meeting them, which the delegates propounded.

The second part of the brochure is a useful account of the existing provision made for the teaching of International Relations. The work of the Institut Universitaire Des Hautes Etudes Internationales at Geneva, described in a letter from Professor Paul Mantoux, is apparently restricted to the post-graduate level ; the teaching in Italy is not very extensive, and mainly confined to International Law, Treaties, and Diplomatic History ; while in France the work has been hampered in the past by the deep division in French university organization into Faculties of Law and Faculties of Letters. But (as one already suspected from Professor Grayson-Kirk's book on *The Study of International Relations in American Colleges and Universities*) it is in the U.S.A. that the subject has advanced furthest; so that in his account of existing facilities Professor Furniss has been able to give a clear and detailed outline of a systematic study of International Relations at the undergraduate (sophomore) level. Clearly the new role of the U.S.A. in world affairs since 1945 has had an impact on the college curricula. In the U.K. there are now four Chairs of International Relations or International Politics (at Aberystwyth, London, Oxford and Edinburgh) and a Lectureship in International Relations at Aberdeen ; but it is only at London that any extensive provision, both at the undergraduate and post-graduate level, is yet found. A short section on the contribution of Extra Mural Departments in this field is included, for, although the report is concerned primarily with internal students, it has been in Tutorial classes and Extension courses that most of the teaching of International Relations in this country has so far been done. Inside most universities and university colleges there is, in this field, as yet little sign of life.

J. F. C. HARRISON.

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